THE

Agricultural Gazette of India.

A

MONTHLY JOURNAL

DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

EDITED BY

ROBERT KNIGHT, F.S.S.

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TO THE

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THE

Agricultural Gazette of India.

A WEEKLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE

VOL. [illegible] BOMBAY, MONDAY, 21st AUGUST 1871. [No. 1

Agricultural Gazette of India.

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NOTICES TO CORRESPONDENTS.

THE following questions, amongst others, have been put to us by our correspondents. We have slightly altered the form in which they originally reached us, in the hope of rendering them more useful to the general reader. While we shall do our best to assist our readers in this way, we must beg them to understand that we can only deal with questions of general interest —

Is the black mud found in the bed of tanks and slow-running rivers of any value as manure?

Yes, when properly prepared it is very valuable for all kinds of soil, more especially for those of a sandy description. After being raised from the bed of the tank it should be thoroughly exposed to the action of the sun. In the fresh state it is hurtful to growing crops, from the sulphuretted hydrogen it sets free; spread in thin layers over the ground, and exposed in hot sun for 2 or 3 weeks, these noxious qualities will pass off. Mud of this description is always more valuable, when, after being mixed with lime, old plaster, house refuse, ashes, &c., &c., it is made into a compost.

How should Poudrette be used as a manure for green land?

It should be mixed with ashes, road-scrapings, brick-kiln dust, old mortar, &c., and made into a compost. After remaining 4 or 5 weeks in the heap, it may be turned, and, after another 2 or 3 weeks, may be spread at the rate of 8 or 10 tons per acre over the green land; this should be done during dull showery weather, and if the land is under irrigation, it will be well to abstain from watering until at least a month after applying the dressing.

What crop can you recommend for cutting for green food for stock?

Yellow Cholum (Holcus Sorghum) is undoubtedly the best fodder produce this season in this country. It may be grown as a dry crop, when it will give 2 or 3 cuttings during the season, or it may be grown under irrigation, when 6 or 7 cuttings may be obtained, and a green yield of about 20 tons the acre of most excellent fodder may be expected. There are many other crops well adapted as fodder plants, all the cereals, and many of the leguminous crops, are cultivated for this purpose.

It is only necessary, at least in India, that if the object is to get the largest quantity of fodder, it is absolutely necessary to cut down the crop before the seed hardens, and so prolong the necessary cultivation [illegible]

At what age should a Bee hive be [illegible] for honey?

[illegible] should wait for the hives [illegible] which the [illegible] usual. Under usual circumstances, it is not advisable [illegible]

Ans.

to allow even access to the sun until they are at least [illegible] years old, so that the bees will fill when the cow is nearly 5 years old. Under proper management, there is no reason why they should not [illegible] a two-year-old.

Is deep ploughing always advisable?

Certainly not, there are circumstances under which it would be absurd [illegible] to plough deep. Thus many subsoils consist of poor stiff clay, which, if turned up in any quantity, might remain for months on the surface of the land, doing great injury and rendering it impossible to prepare a proper bed for the reception of seed. Again some subsoils contain a combination of sulphur and iron, which, if brought to the surface, would poison all vegetable growth for months afterwards, and probably result in the loss of at least one crop after the deep ploughing. Again, on a poor sand resting on a sandy subsoil, which through careful cultivation, has improved in quality, it would be the height of folly to plough under the richer surface and bring up the sterile subsoil.

By all means aim at being ultimately able to plough deep, but do the work gradually, inch by inch, year by year.

Is country Limestone of any value as a manure; and, if so, how should it be applied?

Yes, very valuable for all soils needing lime; it must, however, be thoroughly calcined before it can be of much use as manure. It certainly will act without being calcined, but the action of unburnt lime is so slow as to produce little or no perceptible effect on the crops.

If the soil to be limed is sandy, and contains a large quantity of organic matter in a half-decomposed state, the lime should be slaked and applied over the land at once while in the caustic state. If the land is in good condition, the lime should be exposed for a week or two after slaking, in order that it may take up carbonic acid from the atmosphere, and as much of it as possible become a carbonate.

What English agricultural implements, machines, and tools, can be profitably introduced on an Indian Farm?

Light iron and wooden ploughs, cultivators' bullock harrows, [illegible] machines, rollers, chaff-cutters, winnowing machines, wheel barrows, grass-knives, picks, mattocks, shovels, hand-hoes, sheaf-[illegible], &c., &c.

Which is the most valuable for light land, Bone dust, or half inch bone?

Half inch bones.

LETTERS TO THE EDITOR.

PROFITS RESULTING FROM TEA AND COFFEE PLANTATIONS ON THE NEILGHERRIES.

To the Editor of the
Agricultural Gazette of India.

SIR,—I see that you have reproduced in your last issue series of letters on tea and coffee, and in spite of all that has already been written, I will claim your indulgence for adding thereto a few lines. One of the correspondents remarks "no tea-planter has thought it worth-while to urge anything in support of the wonderful statements about the profits of tea" The probable reason for this is, that as yet tea-planters in Southern India are few and far between, and with three or four exceptions, men who have had no practical experience of tea-planting, but like most pioneers have to purchase that experience rather dearly. I should have written earlier on this subject, but for the hope that tea might find some worthier champion, and now that I have taken up my pen, I do not mean to work tea up at the expense of coffee, as the correspondent of the *Mail* has done, but merely to give you the result of my experience and observation as fairly and impartially as I can. My experience of tea-planting has extended over several years, and more than one district of India. Since I came here, I have seen a good deal of coffee-planting, and as it is natural enough to make any rash estimates regarding coffee, or to cry it down, I trust my remarks will give no offence to those of your readers who are engaged in that branch of industry. There is, I think, ample room in Southern India for both, perhaps, and neither can do itself much good by crying down the other.

There is not necessity for my making any comments upon Mr. [illegible]'s estimates for planting and working 50 acres of coffee. Two or three, and a Wynaad planter have already handled those questions recently, and they are better acquainted with the subject than I am.

It only remains for me to take in hand Mr.——'s statements on tea-planting. To commence, "somehow very little confidence is reposed in it (tea-planting) as a profitable undertaking by most planters." The answer to this very true statement is, that hardly anyone on the Neilgherries, when they commenced the cultivation, had ever been in a tea district, or knew anything about it. Coffee has been grown on those hills for many years; and there are, I should admit, an equal proportion of paying and non-paying estates. The chief essentials requisite for making an estate pay, be it tea or coffee, are thorough knowledge of the business, energy, and high cultivation. Capital of course is a *sine qua non*; but not quite to the extent Mr —— would have us believe.

Mr ——mentions one estate in particular, which was sold for Rs. 6,000. I believe I am acquainted with the estate in question. It was planted, like most other estates here, under the disadvantages already named; but, having surmounted these, promises to become a very valuable property indeed. I very much doubt whether he would induce the owners to part with it again for three times the amount it was sold for

Some men are of opinion that if a man is a good coffee-planter, he must understand tea-planting too, whereas this does not follow at all. Now a great deal of the success of a tea estate depends upon how it is pruned. I believe I fairly understand pruning a tea-bush, with a view to getting the largest possible amount of leaf off it in one season, but would not on the strength of that, advise any of your correspondents to trust their favourite coffee-bushes to my tender mercies. The result would, I fear, be eminently unsatisfactory. Again, a thorough knowledge of the processes of manufacture, and of the mechanical appliances now employed to reduce the cost, is not to be learnt in a day, and the tea-planter requires even more than the coffee-planter to live up to his time. No doubt a man who has been a coffee-planter, can, by going to the fountain-head, learn his work in a much shorter time than one who knew nothing about planting when he commenced, and that the same will hold good of a tea-planter, who wishes to learn coffee-planting.

The next statement requiring notice is, "fifty acres would make a decent plantation on a small scale, but few men are requisite to work it, and it can be better supervised." It is undoubtedly better to have 50 acres, and work that well, than to have 200 and allow them to go to the dogs. There is, however, a medium in all things. My own opinion is, that for a private individual residing on, and managing his own property, from 70 to 100 acres is the most desirable area to have in cultivation. With regard to labour, the tea estate has this advantage, *viz.*, that a certain staff must always be on the spot the whole year round. In Bengal, a head per acre is considered necessary to work the estate, if high cultivation is carried out; but here on the Neilgherries, I think I shall eventually be able to do with ½ head per acre, at any rate, if the estate be kept clean and in good order from the first.

To continue, "such an estate cost, I will say, Rs. 50,000." I should be happy to contract with the author of this statement to open out for him an estate of 50 acres for that amount, and to work it until it was three years old, and paying its expenses. By so doing, I should pocket somewhere about £3,500.

"One superintendent, and one efficient tea-maker is enough. Their joint salaries would amount to no more than Rs 100 per mensem." I very much fear that both the superintendent and the efficient tea-maker need belong to that happy class of mortals, who

> Want but little here below,
> Nor want that little long.

The efficient tea-maker is somewhat beyond my comprehension. If he is to work off, single-handed, the 80,000 lbs of green leaf mentioned lower down, he will have his time pretty well employed. I should feel deeply indebted to any of your correspondents who could pick up such a valuable acquisition to my estate. * * * "Labour would cost Rs. 303 per month." This statement is nearer the mark, as thus much might be spent the first year of working the estate, afterwards one-half ought to suffice. "Buildings would amount to about Rs. 5,000 annually." This outlay would depend a good deal on what Mr. —— means to build, but I may add, that all necessary buildings might be finished in the best style for the estimated outlay of one years' building For the first two years, little or no pucka building is requisite Building, during the first two years of a tea estate's existence, is prematurely sinking capital which might be better employed

"The leaves of the tea-plant can be plucked when the latter is a year old." * * * * * "The first year's harvest will be, say, 15,000 lbs. of prepared leaf" * * Now, Sir, the only picking done for the first eighteen months, is to pick the tops off straggling remaining shoots, with a view to making the plants bush out below Such a yield, as Mr. —— mentions, would not be obtained for four or five years from an estate of fifty acres. One tea estate in Darjeeling district, did, when one and a half year old, give 80 lbs. of made tea per acre, paying a dividend of 16 per cent.; but this is so exceptional a circumstance, and so utterly impracticable on this side, as hardly to merit notice. I shall have more to say on the subject of yield towards the end of my letter.

If Mr. ——gets the "low rate" of Rs. 1-8 per lb. for his tea he may think himself very lucky First class teas, sold either in London or Calcutta (the two great markets) seldom fetch much over 1 Rupee, and this is considered a good paying price. I quite agree with Mr. ——'s remark, that his estimate "is but a rough statement," and am sorry that I cannot go further still, and say that it is "correct in the main."

I will now add a few remarks of my own on the relative advantages of tea and coffee planting. The points in favour of tea, are, in my opinion:—1st. That a man working on his own account can have his lot cast in a better climate for tea, in this part of the world, grows best from about [illegible] 2nd—I think a tea estate can be worked a little cheaper. 3rd—That the crop coming in all the year round, a dry hot season, or cold winds, cannot very materially lessen the year's out-turn. 4th—Building and machinery are not so costly. 5th—Transport is easy, tea being bulk for cattle and more valuable than coffee. 6th—Borer and other similar plagues have not so great a foothold for tea, as they have for coffee or cinchona. The disadvantages of tea are: 1st—That a regular supply of trained labour must always be at hand. 2nd—The European Manager can seldom leave his estate, if a large one. 3rd,—Seed has to be imported from a distance at great risk, (I mean seed worth having) not the rubbishy China plants so generally seen on the Neilgherries. And, lastly, the trouble and care requisite in supervising the manufacture.

The best plan is to go to a district, where the branch of cultivation you mean to follow has been carried on for years; to learn it thoroughly, and then if you have sufficient capital, select a suitable site for an estate, and make the most of the knowledge acquired. Coffee may yield more in a good season, but the steady yield of the tea estate will, I think, bring them pretty level in the end. I would say:—

Let the planter of each stick to his own business, he will get the more by it. No doubt many failures have occurred in both tea and coffee, but in how many cases have the authors of these misfortunes only themselves to thank for it.

On the score of yield, I believe it is quite practicable on the Neilgherries to get a yield of 400 lbs. per acre on a well-cultivated estate in full bearing, and an estate may be said to be in full bearing when six or seven years old. Another time I may trouble you with a few remarks on the differences of growth and yield in different climates; but now I have, I fear, trespassed too far on your valuable space.

Mr ——'s letter cannot have caused much anxiety to any practical coffee-planter, but, at the same time, I hope it will not induce them to accept *cum grano salis* his charming picture of tea. I would add for the information of your correspondent "G.," that I have myself taken share in the purchase of more than 3,000 acres in one estate, and yet dare to hope that I am not a fit subject for a commission in lunacy In some districts of Bengal, this is the rule rather than the exception for the purpose of securing all the surrounding labour. The land, however, in this case is put up at Rs. 2-8 per acre. Ten years are allowed for payment, and no quit rent, or land assessment can be levied. Further remarks on tea-planting I must leave for some future time.—I am, Sir, your obedient servant,

Neilgherries, July 7th, 1871. NEILGHERRIENSIS.

RESULT OF CROPS GROWN IN THE BASSIM DISTRICT OF BERAR

To the Editor of the
Agricultural Gazette of India.

SIR,—Under the orders of Mr Saunders, the Resident at Hydrabad, instructions have been issued for the careful conduct annually of experiments, to ascertain the out-turn per acre of the various crops sown in Berar.

The first series of experiments was completed last season, and as the matter is one of general interest, and such as you desire information on, I have received permission to communicate to you the results of our trials in this, the Bassim district of Berar, during the season now past.

Of course, it will take some years of unremitting care, and the knowledge that we have obtained of the results of a certain number of good average and bad seasons, before we can be assured that we have at all approximated the truth as to *average* out-turn.

Cotton cannot be considered to be the staple crop of this district. We rely rather on wheat and oil seeds; jowaree is also extensively grown. In one particular corner of the district, gram takes the place of wheat in importance.

I have not burdened this letter with observations on the figures sent, since I have made rather full notes in the column of Returns left for Remarks, where the information given is, I think, more usefully available than if I embodied it here.—Yours truly,

KENNETH MACKENZIE.

Bassim, 27th June 1871.

[*Note by the Editor.*]

We are greatly indebted to Mr. Saunders for directing these important Returns to be prepared, and to Mr. Kenneth Mackenzie for so promptly carrying out the work. May we venture to hope that the excellent example of Mr. Saunders will be followed by other authorities in this country.—ED. I. A.

AGRICULTURE.—BERAR, 1870-71.

RESULT OF EXPERIMENTS REGARDING OUT-TURN OF CROP IN THE BASSIM DISTRICT, WESTERN DIVISION OF BERAR, DURING SEASON 1870-71

Crop.		Average experimented on	Seed (in lbs.) per acre sown.	Out-turn in lbs. Article itself.	Straw.	Husk.	Flower.	Remarks.
1		2	3	4	5	6	7	8
Monsoon or Kharif Crops.	Field No. 291							
Cotton	1 Portion measured by Government Agency	1	26	114	...	.....	...	Cleaned cotton... 31 lbs. Seed ..... 83 " = 114
	2 Portion measured by cultivator	1	26	105	.....	.....	...	Cleaned cotton... 28¼ lbs. Seed ..... 76¾ " = 105 (1)
	3 Portion measured under charge of Government Agency	1	24	97	.....	...	...	Cleaned cotton... 26¼ lbs. Seed ..... 70¾ " = 97
	4 Do. do. of Owner	1	26	90	.....	.....	...	Cleaned cotton 24¼ lbs. Seed ..... 65¾ " = 90 (2)
	5 Field No. 271, prepared by Government Agency	1	22	96	.....	.....	...	Cleaned cotton . 26 lbs. Seed ..... 70 " = 96
	6 Field No. 176, do. do	1	20	90	.....	.....	...	Cleaned cotton... 24¼ lbs. Seed ..... 65¾ " = 90
	Field No. 177.							
	7 Government Agency portion	1	20	190	.....	.....	...	Cleaned cotton... 53 lbs. Seed ..... 137 " = 190 (3)
	8 Owner's portion	1	20	140	.....	.....	...	Cleaned cotton... 39¼ lbs. Seed ... . 100¾ " = 140
	Average on 8 acres	...	23	115¼	.....	.....	...	Average: Cleaned cotton 31¼ lbs. Seed ..... 84¾ "

(1) These acres adjoin, and are of the same field. Government Agency spent Rs. 5-6 in weeding their portion, while the Ryot only expended Rs. 3-6. The larger sum represents work more carefully done, and this attention on this point would appear to have resulted in larger out-turn.

(2) A like remark applies to these two acres; the cost of weeding was respectively Rs. 5-2 and 3-10.

(3) Likewise here the Government Agency and Ryot spent on weeding, respectively Rs. 7-9-4 and 4-0-0.

N. B.—The last season for cotton, as far as crop went, was deemed an average one.

The Ryot's experience here tells us that for every lb. of seed (surkee) he should get 3 lbs. of uncleaned cotton (kapas) should his crop be fairly good, and 10 lbs. if extra good, and that every lb. of uncleaned cotton (kapas) contains, he calculates, ½ lb. seed (surkee), and ½ cleaned cotton (roosa). If this experience be correct, the past season's crop was not up to the fairly good average, since (taking figures of average on the whole) we get but 5 lbs. of uncleaned cotton (kapas) for every lb. of seed (surkee) sown, though the proportion of seed and cleaned cotton in this out-turn is nearly as put by ryot, being more favorable for him as to cleaned cotton. The rates ruling during season were, for cleaned cotton (roosa) 80 lbs. a bale of 240 lbs, 2 annas 9 pies per lb.; and for seed (surkee) one Rupee for 40 lbs., or 6 pies per lb.

RESULT OF EXPERIMENTS REGARDING OUT-TURN OF CROP IN THE BASSIM DISTRICT, WESTERN DIVISION OF BERAR, DURING SEASON 1870-71.—*(Continued.)*

	Crops.	Acreage experimented on	Seed (in lbs.) per acre sown.	Out-turn in lbs. Article itself.	Straw.	Husk.	Flower.	Remarks.
	1	2	3	4	5	6	7	8
Monsoon or Khureef Crops—*continued.*	*Rice.* "Dhan" ordinary kind.	1.—Field No. 199	1	104	580	800	240	...
		2.—Field No. 265 (Enam land)	1	104	760	850	290	... (4)
		Average on two acres	...	104	670	825	265	...
	Kootkee, an inferior kind.	Field No. 44	1	18	288	...	60	... (5)
	Jowaree ...	Field No. 44	1	8¼	208	1,068	212	... (6)
		Field No. 40	1	9	600	1,250	250	... (7)
		Field No. 43	1	5	324	1,000	200	...
		Average on three acres	.....	7½	377⅓	1,106	220⅔	...
	Tilly (oil seed).	Field No. 296	1	3	60	...	...	... (8)
	Kurnahla, (oil seed) ...	Field No. 36	1	5	296	...	56	... (9)
	Oorsed, (pulse).	Field No. 300	1	14½	170½	...	49¼	...(10)
Cold weather or Rubbee Crops.	Wheat (11)...	Field No. 209	1	90	448	...	300	...
		Field No. 216	1	102	1,120	...	400	... (12)
		Field No. 221	1	88	784	...	350	..
		Field No. 36	1	88	616	...	320	...
		Average on four acres	.....	92	742	...	342½	...
	Gram (channa).	Field No. 36	1	36	1,390	...	150	... (13)
	Mussoor, (pulse.)	Field No. 36	1	104	490	...	150	...(14)
	Lakh (an inferior sort of pulse.)	Field No. 14	1	72	416	...	200	... (15)
	[illegible] (oil seed)	Field No. 202	¾	4	160	...	...	...(16)
	Murdee oil seed, its flower called kusumba	Field No. 185	¾	26	360	...	100	54 (17)

(4) The crop in this field (No 265) followed one of sugar-cane, and as latter requires, and is giving a considerable quantity of manure, the effect is apparent in the large out-turn as compared with that in field (No 199), where the crop was raised on land not previously manured.
Bazaar rate for cleaned rice (chawul) during season was one rupee for 18 lbs.
The straw fetches nothing, but is used, mixed up with other things, to feed owner's cattle.
Ditto ditto ditto ditto as to husk.
(5) Believed to be a fair crop. The selling price during season being 24 lbs. for the Rupee.
(6) This field, No 44, suffered greatly from a weed called "taluk," which is most destructive to the crop, hence diminished out-turn.
(7) This field, No. 43, was not particularly good land.
Bazaar rate for jowaree in season, was one rupee for 38 lbs.
The straw (kurbee) in season, fetched only Rs. 3 per 100 bundles of 300 lbs. in weight, but usually the greater part of such is stacked for sale during the rains, when the price just doubles, and frequently rises to Rs. 10 for 100 bundles.
The husk (boosa) is seldom sold; it is kept for feeding owner's cattle in the rains.
(8) Crop said to be below average, the situation of field being such that it suffered excessively from rain. Selling price in season, 10 lbs. for a rupee. Another kind of "tilly" is grown in the cold season shown below.
(9) Said to be a fair crop, the husk not sold usually. Selling price in season, 24 lbs. for a rupee.
(10) This is a crop but little raised in this district. The out-turn said to be fair. Selling price, 28 lbs. for a rupee.
(11) The season for wheat was deemed to have been fair. Selling price in season, 20 lbs. for a rupee. The husk is usually kept to feed owner's cattle during rains.
(12) This field (No 210) had previously a crop of sugar-cane, the manure given to which, shows its effects on the out-turn in wheat. The crop in other fields had not this advantage.
(13) Said to be a fair crop. Selling price in season, 34 lbs. for the rupee. The husk seldom sold, kept for cattle.
(14) Said to be a fair crop. Selling price in season 22 lbs. for the rupee. Husk kept for cattle. This is the favourite pulse crop of the district.
(15) Said to be a fair crop. Selling price in season being 16 lbs. for one rupee.
(16) Said to be a fair crop. Selling price in season, 10 lbs. for a rupee.
Another kind of "tilly" is grown in the monsoon shown above.
(17) Crop said to be under the average. Selling price in season, 32 lbs. per rupee. Husk not used for anything. The flower just before it droops is picked, and is used extensively as a dye, and sells 3¼ lbs. for the rupee.

N.B.—The rainfall in the portion of the district where these lands lay, from 1st My 1870 to 30th April 1871, was 39 inches 78 cents.

The land for both seasons, monsoon (khureef), and cold weather (rubbee), are prepared in May. Those for the former are sown shortly after first rains in June. Those for the latter remain fallow during rains, being kept weeded and cleared, and sowing in them commences sometime towards end of October. The monsoon (khureef) crops are all in by December, the cold weather or (rabbee), by end of March.

KENNETH MACKENZIE, Captain,
Assistant Commissioner,
in charge, Bassim District.

Bassim, 27th June 1871.

IRRIGATION IN UPPER DOAB.

To the Editor of the
Agricultural Gazette of India.

SIR,—In one of your papers of last March, you have given two extracts from the *Pioneer* on the subject of Irrigation in the Upper Doab. The subject is one which I hope you will find leisure to discuss. Not only should the subject of excessive irrigation be carefully gone into, but the whole question of irrigation requires, in my opinion, to be more carefully examined than it has hitherto been. The system of agriculture, which has been extensively increased and fostered by irrigation, is that primitive method by which we used to grow mustard and cress in the nursery. Until all the properties necessary for the food of plants are exhausted, the cultivator can go on growing crops by scratching the earth 3 inches deep, and pouring in plenty of water. But this must have an end some time. Nature will not be defrauded with impunity. It is an essential principle of agriculture, that what we take from the soil we must return to it again. Simple rotation of crops will not effect this. It is evident to anyone who will think over the subject, that to cultivate, water is not the only essential. In fact, this is such an obvious truism that it would be hardly necessary to notice it, but that both in India and in England people have been in the habit of writing, as if you only required a plentiful supply of water to turn India into a garden. But the most important question for discussion is this. Supposing the Government completes its scheme of irrigation, and makes India a network of canals, what will be the effect of this irrigation on the climate of India? If irrigation has already plainly and unmistakeably changed the climate of Mozufferuggur and Seharanpore, it can scarcely be doubted that it has also affected materially the climate of the North-West, and it is beyond question that the effect of a complete system of irrigation throughout Upper India will be immense. It may be that the climate will benefit by it, but, to judge from what we now see, there is a possibility, I may almost say a probability, that Upper India will become a malarious swamp in the rains, and a red hot furnace in the hot weather. Surely, the question might be solved beforehand. There must be men of science, who can tell the Government what such an extension of irrigation will result in. In a small pamphlet published lately, called "Is Irrigation necessary in Upper India?" Major Corbett, a practical farmer, shows that the real want of Upper India is good farming. Deep ploughing and manuring will, in his opinion, make India more fertile than any amount of water; and from his experiments, he is led to the conclusion that the cold weather crops could be grown without irrigation, and with even half of the average annual rainfall. On this point I do not feel qualified to give an opinion, but the accuracy of this statement of Major Corbett's might be easily determined by experiments, as he suggests; and, if found to be true, we should then assess unirrigated lands much higher than we do now. It is quite possible that what I may call the water-theory of cultivation, causes settlement officers to assess unirrigated lands too low. However this may be, there can be no doubt that we should ascertain beforehand the probable effect of irrigation on the climate. For, if irrigation be necessary to insure the supply of food, but will bring with it disease and death, then it will be better for the people to incur the risk of famine, than to have a certainty of food cursed with a climate which will destroy as surely as famine, if more slowly, and in which fever and sickness will render life a burden, and death a relief. In England, they have drained all their water away, and now talk of irrigation. Let us be more far-sighted here. If, as Major Corbett says, (and his reasoning appears sound and conclusive) irrigation is, as a general rule, unnecessary, why spend all this money in canals which may destroy the climate, and prove a dead loss to the State? At least have the question examined scientifically before we go any further. On the other hand, if we can grow crops by deep ploughing and manuring, and without irrigation, there seems to be, as Major Corbett shows, good reason for supposing that we should cool the climate most considerably. I hope that what I have said will lead you to look into the subject. Depend upon it, if we go on growing crops by sheer supply of water, we shall repent some day.

RUSTICUS.

EDITORIAL NOTES.

FROM a report lately published at St. Petersburg, by M. Morder, on the breeding of horses in Russia, it appears that the number of horse fairs held in 357 towns and villages is 1,071 every year. The number of horses sold at these fairs is upwards of 300,000, at an average price of £9 each. The total number of horses in European Russia amounts to 19,226,667, or one to every three inhabitants.

ANOTHER Meat-preserving Company (says the *Melbourne Argus*) is to be added to the number now in operation in New South Wales. The Sydney Meat-preserving Company will be prepared to commence in about three months, and their works are being constructed, so as to permit of 1,000 sheep being tinned in a day. The site of the works is eight miles from Sydney on the Paramatta river.

THE American Commissioner of Agriculture reports that tea culture is fast becoming a feature of importance in the Western and Southern States, and that in a few years enough tea will be grown in those sections to meet the home consumption. The department has sent to various parts of the country over 50,000 plants, nearly all of which have lived, and the department is now distributing seed from plants raised in South Carolina.

A TRIAL of the milking properties of cows of the Dutch and Ayrshire breed has been made in America, from which it appears that the former afford most milk. Three Dutch cows, we are informed by a correspondent of the *Country Gentleman*, which were well bred and exceptionally good ones, gave, in about the course of a year, 9,680 lbs. of milk, while the Ayrshires only yielded 7,706 lbs. The average of the days the Dutch cattle gave milk was 328; that upon which the Ayrshires were milked, 334. The Dutch cows were much heavier than the Ayrshire ones, and to this the correspondent attributes their superiority.

The *Belgian Moniteur* gives some details of the approaching harvest in Europe. In Prussia, the prospects are unfavourable, much of the autumn sowings perished, and those of the spring are suffering from the want of warm sun; in Saxony, the appearance is better, as the crops are thick and healthy; in Russia the yield is expected to be a good average, and a very large quantity of last year's stock still remains unexported at Odessa. In Roumania, Bulgaria, and Bessarabia, the aspect is most favourable; and in Hungary, an abundant harvest is expected. In France a large portion of the winter corn is lost, and the fields have had to be re-sown.

A MR. JUNKER is now on his way to Europe from Japan with a cargo of silk worm eggs. He came from Jeddo by way of San Francisco, and purposes to dispose of his eggs in France, Italy, and Turkey. The eggs are enclosed in a hundred boxes, and are forwarded in a special car. Each box is about 2 by 1½ feet, and 12 inches in depth, in which the eggs are carefully packed in layers, giving a free circulation of air. The two chief sources of damage to the eggs in transportation are moisture and heat, and great care is required to protect them from storms and suffocation. The value of this venture is estimated at about 600,000 dollars. The eggs are firmly attached to pasteboard, by the natural secretions of the insect, and in this condition, present the appearance of very coarse sand paper.

THE production of tobacco and cigars in the United States, from the 30th of September 1862, to the 30th of June 1866, amounted in the whole, to 312,638,887 lbs. of tobacco, paying a revenue of 80,090,669 dols., and to 3,727,421,219 cigars, paying a revenue of 19,853,996 dols. The returns to the bureau of internal revenue for the year ending the 30th June 1870, gives the production of tobacco and snuff at 61,589,938 lbs., on which a tax of 32 cents per lb. was paid, and 28,698,142 lbs., on which a tax of 16 cents was paid. The revenue from tobacco and cigars during that period was 31,350,707 dols., of which, New York alone paid 7,922,396. Between Michaelmas 1862, and Midsummer 1870, the United States Government derived from tobacco, snuff, and cigars, an aggregate revenue of 131,295,363 dols.

THE *Gardener's Magazine* gives the following directions for preparing Asphalt or Concrete Flooring:—

"Three parts coal-ashes (those from the blacksmith's forge) to be prepared, and two parts gas-lime from gas-works, to be thoroughly mixed, and then made into a mortar, with gas-tar. If the gas-tar come from gas-works where the ammoniacal liquor is not separated, it will be sufficiently mixed for the

purpose; but if the latter be separated, and the tar be thick, it will set quicker if about one-fourth part of water be mixed thoroughly with the tar when used. For the floors of cow-sheds, this should be laid about three inches thick in one layer, on an even surface of gravel or stone broken very small with a sprinkling of gravel over, and rolled down. The mortar may be laid on with a common shovel, and merely patted down flat. In dry warm weather, if the mortar has been carefully made, the floor will set firm in a few days. For any ordinary outhouse, half thickness will make a permanent floor.

UNDER this title, the *Gardener's Magazine* says:—

"Feed your poultry on raw onions chopped fine, mixed with other food, about twice a week. It is better than a dozen cures for chicken cholera. Fowls exposed to dampness are apt to be troubled with catarrh, which will run to croup, if not attended to. Red pepper, mixed with soft feed, fed several times a week, will remove the cold. Pulverized charcoal, given occasionally, is a preventive of putrid affections to which fowls are very subject. Sitting hens can be cured by putting water in a vessel to the depth of one inch, putting the hen into it, and covering the top of the vessel for about twenty-four hours. The vessel should be deep enough to allow the fowl to stand up. This is the best remedy I have ever tried. Pulverized chalk, administered with soft food, will cure diarrhœa. This disorder is caused by want of variety in the food, or by too much green food. Garlic food, once or twice a week, is excellent for colds."

THE official statement of imports and exports of the United States has been published. From the export tables we gather a few interesting particulars in connexion with agricultural matters. The value of agricultural implements sent out of the States last year to other countries amounted to 1,034,140 dols. The quantity of wheat shipped was 33,547,638 bushels, and the value 40,548,780 dols.; and of flour there were sent away 33,547,638 barrels of the value of 19,895,225 dols. No fewer than 189,640,893 barrels of oil-cake were shipped, at a price of 3,765,140 dols; 24,645,890 lbs. of bacon; of beef, 20,533,216 lbs., the cost to the purchasers being 2,310,064 dols. The exports of butter made 670,282 dols., the quantity being 2,979,101 lbs. Of cheese, 59,115,090 lbs. were exported, the value received being 8,646,491 dols. Lard was largely supplied to foreign customers. The total quantity exported was 48,101,997 lbs., and the value thereof 6,050,507 dols. Pork to the extent of 29,256,213 lbs. was shipped, the price for the same being 3,655,586 dols. The tables generally shew trade in America to be in a flourishing condition.

IT appears, that between 1860 and 1869, more than 750,000 acres of land were sold in Queensland, the number of pastoral leaseholds having increased from 1,300 to 3,500. There were 41,000,000 acres under lease in 1860; in 1869, the total had risen to no less than 170,000,000 acres. The area of land under cultivation increased from 3,353 acres in 1860 to 47,634 acres in 1869. In 1860, there were 14 acres of land under cotton; in 1869, there were 14,426 acres devoted to the production of the same article. Cotton-growing has been greatly fostered in the colony by Governmental encouragement. Sugar-planting has received no direct official encouragement, but it has succeeded because it is suited to the soil and climate of the coast lands of Queensland. In 1865, there were 93 acres under cultivation with sugar-cane; in 1869, the total had risen to 5,165 acres. At the date of the separation of the territory, now known as Queensland, from New South Wales, there were 23,000 horses in the separated districts; in 1859, the total had risen to 71,000. Similarly, the number of cattle had increased from 432,000 to 890,000, and of sheep from 3,000,000 to 8,500,000.

THE real question in regard to enriching the land by deep ploughing is whether we can furnish a better "pasture for plants" at a less cost, by developing, on the one hand, the latent plant-food in the subsoil, or, on the other hand, by thorough working and manuring the surface soil, six or eight inches deep. There can be no doubt that many of our subsoils contain large quantities of latent plant-food. But we think that it is not often that they contain more than the surface soil. The reason that our soils are not as productive as we could wish, is generally not from a lack of plant-food in the soil, but because it is not in an available condition. It is inert and insoluble. And the question is how to make it available. On Mr. Lawe's experimental wheat-field, the soil of which is in no way remarkable for its fertility, he has got, by ploughing the land twice, to the best of our recollection, not over five or six inches deep, and by hoeing two or three times in the spring, an average yield of 15 bushels of wheat per acre every year, for a quarter of a century, without a particle of manure. By adding on adjoining plots, otherwise similarly treated, 200 lbs. or so of ammonia, phosphoric acid, and potash, he gets 30, 40, and sometimes 50 bushels of wheat per acre. Now the real question is how to get this 200 lbs. of extra plant-food. Can we get it cheaper by deep and thorough tillage, or by making and applying more manure? That there is abundance of plant-food in ordinary clay loams cannot be doubted. An acre of soil a foot deep weighs about 3,000,000 lbs. Is it better to break up, work over, pulverize, and expose to the atmosphere, this amount of the soil, or, to work over say 2,000,000 lbs. more thoroughly, and frequently, and at much less cost, and spend the money thus saved in making and buying an extra quantity of manure? When we are enabled to work land a foot deep by steam, and to do it at the right season, we have no doubt that it will be cheaper to work over the 3,000,000 lbs. of soil, until it is as fine as a garden, but to do it with horses is too expensive. We can break it up once, but that is not enough. It must be worked thoroughly afterwards, and the whole mass brought in contact with the atmosphere. This is where we usually fail. Many plough deep enough, but very few cultivate sufficiently afterwards. On ordinary good loamy soils our rule at present should be to plough steadily along. The cost of an extra horse is not much. Then our cultivators should run as deep as four horses abreast can work them rapidly. A cultivator going through the soil at the rate of three miles an hour will break up the soil more effectually than one going at the rate of two miles. Three horse-ploughs and four horse-cultivators should be our favourite implements until we are ready for the steam plough.—*American Agriculturist.*

IN an order dated 14th July, Government have briefly noticed the report of the Sydapet Farm Committee for 1869-70 as well as that for 1870-71. In 1869-70, fifty acres were added to the farms, which, at the close of that year, comprised about 103 acres. In 1870-71, the area was increased to 250 acres by the addition of a tract on the north side of the estate, and this tract the Committee propose to cultivate "on economical principles as a Model Farm," reserving the original or "South Farm for experimental purposes. The Committee believe that the "Model Farm" will be not only a self-supporting, but a paying institution. Mr. Robertson's reports are replete with interesting matter. Under the direction of the Committee, the range of his experiments has been gradually widened, and while scientific inquiry is brought to bear upon Indian husbandry in all its branches, practical results are exhibited with a regard to minutiæ, which shows that the Committee and Superintendent fully appreciate the important influence which a thorough elucidation of the subject may exercise upon the country at large. In both these respects, the management of the farm during the last two years contrasts most favourably with the earlier stages of its history. Among the topics which have engaged the attention of the Superintendent during the last two years, the following may especially be mentioned:—Improvement of the breed of sheep by "selection, greater attention to fodder, &c," experiments conducted with a view to ascertaining the best kind of fodder for cattle. Inquiry, both by chemical analysis and careful attention to practical results into the respective merits of different manures—animal, vegetable, and mineral.

The [illegible] under certain circumstances, with a view to economy. The effects of continued cultivation upon the productive capacity of different soils. Comparison of the results obtained with various agricultural implements. Indian and European cultivation under circumstances favourable for scientific investigation of various crops, chiefly those of which the success is still a matter of experiment. The receipts of the year 1869-70, including the balance remaining from the preceding year (Rs. 1,470), and the amount received from Government (Rs. 18,[illegible]), aggregated Rs. 19,888-14-6. The expenditure was Rs. 16,[illegible]-3-8, of which Rs. 10,443 was expended in supervision and labour. The report for 1870-71 does not contain the requisite particulars as regards the whole estate. It is requested that this omission may be rectified. The Committee was requested to communicate to Mr. Robertson the high opinion which the Government entertain of his qualifications, and their appreciation of the zealous and able manner in which he has conducted his duties.

THE First Prince of Travancore has, we are told, addressed a letter to the Madras Government on the importance of introducing the cultivation of the manioc or tapioca plant into the Madras Presidency. "Some twenty years ago," says His Highness, "the manioc was scarcely cultivated even in Travan-"core, but of late years its cultivation has been very rapidly ex-"tending. A large tract of undulating land between the great "forests fringing the ghauts on one side, and the sea-coast on "the other, is formed of hard laterite soil, little fit for cultiva-"tion, excepting the valleys which intersect them, and over-"grown with stunted vegetation. These hill sides are fast "becoming green with manioc plantations, carried on princi-"pally by the peasant-population. Limited as the cultivation "of manioc is even in Travancore, it has, I am convinced, amply "shown that in the ease and cheapness of production, in the "abundance of yield, in its adaptability to almost any soil, in "its almost entire independence on the seasons and on water-"supply, in its nourishing quality as an article of diet, this stands "behind no other agricultural product known in India. While "rice will meet the necessities of the higher and middle classes, "the manioc is, one may reasonably believe, destined to a great "extent to become for the poor classes of India what the potatoe "is in Ireland, what the bread-fruit is in Java and other islands "in the Indian Archipelago, and what the date-palm is in "Arabia."

AT the annual exhibition of the Madras Agri-Horticultural Society, to be held early in February 1872, the following "extra" prizes will be open to the produce of the Madras Presidency, Mysore, Coorg, Travancore, and Cochin :—

Best sample of Coffee, not less than 25 lbs., of which 10 lbs. in parchment and 15 lbs. clean,...	A Gold Medal.
Best sample of Tea, not less than 5 lbs...	A Gold Medal.
Second best sample of Tea, not less than 5 lbs	A Silver Medal.
Best sample of Indigo	A Silver Medal.
Best sample of Carolina paddy in the straw, not less than 20 lbs.	Rs. 20
Second best do. of Carolina paddy in the straw, not less than 20 lbs.	„ 15
Best sample of Carolina paddy seed	„ 50
Best cured sample of exotic tobacco, not less than 10 lbs	„ 15
Best cured sample of country tobacco, not less than 10 lbs ...	„ 5
Best Indian corn, not less than 24 cobs..	„ 20
Second best do. do.	„ 10
Best specimen of green food for cattle or horses, not less than 1 cwt.	„ 20
Second best do do.	„ 10
Best sample of Western Cotton, not less than 25 lbs. cleaned, and 5 lbs. in the pod..	A Gold Medal.
Best sample of Guzerat cotton, not less than 25 lbs. cleaned, and 5 lbs. in the pod	A Gold Medal.
Best sample of Coimbatore cotton, not less than 25 lbs. cleaned, and 5 lbs. in the pod	A Gold Medal.
Best sample of Tinnevelly cotton, not less than 25 lbs. cleaned, and 5 lbs. in the pod	A Gold Medal.
Best sample of silk, not less than 1 lb.	Rs. 20

Each sample of coffee, tea, or cotton, &c., must be accompanied by a written declaration from the exhibitor stating how many acres or cawnies of land he has had under cultivation, and that the coffee, tea, or cotton exhibited is *bona fide* the produce of that land. The following prizes are available to all the world :—

Best [illegible]	[illegible]
Best [illegible]	Rs. 20
Best [illegible]	[illegible]

THE AGRICULTURE OF INDIA.

[*By Lieutenant-Colonel Boddam.*]

MAIZE.

Maize or Indian corn are identically the same. The male flower is the plume at the top of the stem, which blossoms like wheat and evolves an immense quantity of pollen, which wafted about by the wind, fertilizes the female portion of the plant (the ears or future cobs) which spring forth from the junction of a leaf with the stalk. These are at first a mere tassel of delicate threads; there is one of these to every incipient grain of corn; they receive the pollen of the tassel and are fertilized at once. If any thread is injured or broken, the grain belonging to it is lost; if all are fertilized, the ear is beautifully regular and complete. Where purity of kind is required, only one variety must be sown.

Maize may be divided into two kinds, table maize and farm maize. The white Georgian maize only is used by Americans for table purposes, all the yellow varieties for flour and cattle food. Besides being useful for human food, Indian corn meal is excellent for fattening stock, milch cows, sheep, and poultry. It is much used in dry summers in America as green forage, the stems being then very sweet and agreeable to cattle. When much Indian corn is grown in America, the husks of the ears are saved, and used for stuffing mattresses, bolsters, &c., and it is a material always clean, sweet, and elastic. Paper is also made of a good quality for wrapping. The dry stems and leaves also make fair fodder for cattle.

For farm purposes, Queensland and other Australian kinds are recommended; for eating, the American white Georgian.

ONIONS.

The Bellary onion is grown both from seed and by multiplication of the roots.

By the latter mode, the cultivation commences in July. A month previously the beds should have been prepared, dug five or six times, till the earth is free from clods and very fine, and manure liberally supplied (the kind of manure is not mentioned).*

The onion is cut in two and the lower half planted (after stripping off the outer coats) four or five inches apart in little furrows.

Water should be given every four days, and fresh manure spread every month.

The onions will be ready to be dug up in three months. The bulbs used for this kind of cultivation should be a year old.

By Seed.

The seed should be sown broad-cast about the end of June or the beginning of July, previous to which the beds should have been dug five or six times and manured.

Water should be given every four days. In two months, when the root of the seedling is about the size of a grain of Bengal gram, they should be transplanted into beds, carefully prepared as above and previously watered. The plants should be about two inches apart. Water should be given once in four days, and manure spread once a month. In six months from the time the seed was sown the onions will be ready.

Seed may be again sown in October. Red soil is most suitable for this cultivation. These onions can be obtained at the rate of three maunds for a rupee. A considerable quantity could be procured.

ENGLISH PLOUGHS.—[*By Lieutenant-Colonel Boddam.*]

Two light ploughs are recommended for use in Mysore, having been now tried some time in Madras, and recently at Bangalore :—

1st. Ransome and Sims very light iron plough, used in England for pony, mule, or donkey, adapted for ordinary Mysore plough bullocks, with pole and yoke. This plough is in general construction similar to the Newcastle prize plough, but very much lighter, and has not a lever neck; is fitted with a head wheel; is suitable for ploughing 4 to 6 inches deep, and may be used for all the sorts of dry cultivation in Mysore; especially recommended for ploughing grass land, and for forestry trenching. Price Rs. 36.

2nd. Combined plough, that is, made up of wood and iron, on the same principle as the iron plough; but it is a swing plough with wooden stilts and pole, has no directing or land wheel; the whole of the iron work, including the mould-board is of *malleable* iron, avoiding the loss and annoyance of breakage and castings; wherever there is a village smith, the plough can be made up and repaired.

In the ploughs hitherto sent out to this country, there were objections; they were too heavy for the country cattle, too

* Ashes and cowdung are good for onions.

expensive, and the cast iron parts could not be renewed or repaired by village workmen.

This combined plough only weighs 70 lbs., and costs made up at Madras Rs. 15; in a village, it would be made up probably for Rs. 10. It can be conveniently carried from field to field, and it is so constructed that the driver, while working, is near his cattle; it is easier to plough with than the iron one; altogether has more advantages for native adoption. Mr. Robertson, the Superintendent of the Sydapet Experimental Farm, states that these combined ploughs are as well suited for wet cultivation as for dry.

The native plough cuts out a triangular furrow; the English plough, a rectangular one; while the English plough cleans out its furrow and leaves the under-surface level, the native one leaves a ridged under-surface, nearly half of the land being unworked.

The English plough inverts the soil and brings up each time a fresh surface, while the native apology leaves the soil much in its original position.

The native plough to perform the tilth of the European, has to go over the land several times instead of twice, and even then it is not to be compared to the work of the other.

More labour is got out of the native and his cattle in English ploughing, but not more than is necessary for such effective ploughing, and it is labour well bestowed on the land: many of the operations done by the English are impossible with the native one.

SUGAR-CANES.

DEAR SIR,—In your paper of the 1st instant, there was inserted a copy of the proceedings of the meeting of the Agricultural and Horticultural Society of India, of 15th June last. In these is a paper by Lieutenant-Colonel Boddam on the *sorghum saccharatum*, or Northern Chinese sugar cane. I fancy *songhum* is a misprint. Colonel Boddam says this plant is a native of the north of China. I have heard a good deal about this plant and also about a plant called *impeyar imphee*, which is nothing more than the Scinde jowar. The name impey was, I believe, given to this description of jowar because an officer of the name of Impey first called attention to its superiority to the ordinary up-country jowar. In Scinde, sugar is made from this impey: it is grown over the greater part of the Punjaub, and the natives chew it as they do sugar-cane. In this it resembles the so-called *sorghum saccharatum*. There seems to be a confusion of names, as in the same article it is called *sargo*. The botanical name of the ordinary jowar is *holcus sorghum*. The bajra again is *holcus spicatus*, and one would suppose the *holcus saccharatus* to be a sweeter description of one or the other of these. In growth and the form of its seed it almost resembles jowar, and we may call this impey a sweet jowar. The *holcus saccharatus* was successfully grown in England in the hot season of 1858 and 1859 the crop being about 50 tons to the acre: in 1860, it failed from the season being colder. I shall feel obliged if any of your correspondents will, through your columns, give me information as to whether the *sorghum saccharatum* and the *holcus saccharatus* are identical or not.

Budaon, 24th July 1871. A. F. CORNETT.

MANURING ORANGE TREES.

.....We refer to the cultivation of the orange tree in New South Wales. The fame of the Parramatta orangeries has spread even to Europe; and the nature, as well as the mode of cultivation of the tree with which the proprietors of the extensive groves near Sydney have to deal, must bear the closest relation to those of the coffee shrub. Among the most esteemed of authorities on agricultural topics in Australia is Mr. Josiah Mitchell, lately Lessee of the Government model farm at Flemington, near Melbourne; and some time ago, after paying a visit to the Parramatta orange groves, he gave a full description of the mode of cultivation and especially of the result, as respected manuring, of one gentleman's experience of fifty years on the same soil and with the same fruit trees. Through the courtesy of Mr. Mitchell's brother, one of our oldest planters, we may yet be able to publish this most interesting paper; but the evidence, if we recollect aright, was entirely in favour of surface manuring. The orangeries are, however, mainly situated on gently undulating ground, and the rainfall, except at rare intervals when the country is flooded, is comparatively light. On the other hand, the soil is poor beyond all belief—rock and sand are the chief characteristics, and it is astonishing to see on what barren unpromising looking places the orange trees thrive. In some instances they are allowed to grow thirty feet high, many of them being from forty to fifty years old, but still yielding most plentiful crops, and producing returns which put coffee even in the shade. The trees begin to bear after seven or eight years; young trees are planted wherever a ledge will hold a little earth that the rains when they do come will not wash away; piled up stones, as on coffee estates, keep the soil together in places, but in many cases it looks as if the trees grew out of the solid rock. It is on this situation and under such circumstances that the surface application of artificial manures has been carried on with the most marked success. In speaking of orange trees thirty feet high, we must be considered to give the extreme height; the average height is much lower, although the Parramatta orange groves are altogether lower than the trees are allowed to grow in Spain, where the pruning knife is used as freely as on the coffee tree in Ceylon. But if the cultivation of the orange shews the advantage of surface manuring, what shall we say of the case of Maoussakelle estate, Hewahette, brought forward by Mr. Sabonadiere as an instance of the success of applying manure in deep holes? If we are not mistaken too, this fine property is formed on exceptionally level ground for the Central Province, and we remember a late co-proprietor telling us that after a crop he always walked on coffee berries, so unable was he, with all the attention possible, to pick so clean as he could wish the very heavy crops produced! Mr. C. J. Brown, equally with Mr. Sabonadiere, believed in constant and close supervision, which could only be secured, he thought, by having a superintendent for every hundred and fifty acres of coffee in full bearing.—*Ceylon Observer.*

AGRICULTURAL STOCK—INDIA.

IT needs no apology to devote our columns to a point of domestic arrangement which concerns us all, and by which we may be able to point out a mode in which a considerable saving of expenditure may be made in every household. Almost every house-holder must keep one or more horses, and the maintenance of these animals is a great burden on small incomes. One important item of this expense is that known in every housekeeper's book as "firewood for gram." To boil the gram costs about ten per cent. on its own cost. Boiling has been considered necessary, because of the great increase in bulk that always follows when gram is steeped in water. To give a horse raw gram, would be to give him colic, and perhaps death. If we boil a measure of gram, the result will fill 2½ measures or thereabouts. But exactly the same process would go on in a horse's stomach, and the resultant swelling would cause intense pain, and possibly rupture the coats of the stomach. It must not be supposed that the gram becomes more suitable for food, more digestible, or more nutritious, by boiling: nothing of the sort. Experience has shown that the boiled grain will benefit the animal, and that raw grain will kill him, and it has come to be supposed that the boiling performed some important function, making as much difference as between dough and pudding. This is a mistake. All that the boiling does is to swell the grain. In half the cases where a horse gets colic now-a-days, the horsekeepers have pocketed half the wood, and have fed the animal with half-boiled, that is, half-swelled grain. If the seed can be swelled in any other way, boiling is unnecessary. Nay, more. If the boiling can be obviated, the grain is improved, for the hot water steals the more soluble portions of the seed. Hence many a horsekeeper's children live almost entirely on gram conjee water, living upon the juices that ought to have gone to the horse.

Now, it requires but a single experiment to prove that the grain will swell just as much if steeped in cold water as if boiled. The difference lies in the time required. By boiling the swelling process is accelerated, and is over in an hour or two. By steeping, from fifteen to seventeen hours are required. This however is but a very small matter. Nothing further is required than that the housewife should provide a large chatty or metal vessel,—not copper, unless it be periodically tinned. As each day's feed is given, the next day's supply should be issued, and placed in the vessel for steeping. It will not injure the grain to allow it to remain in the water for twenty-four hours. The energetic Superintendent of the Government Farm has tried many experiments regarding this matter, and, like many other men, has come round to the opinion that in this matter we might have learned wisdom from the natives of the country. It has been known for years that the great native contractors never boiled their gram either for horses or cattle. There are contractors in Madras owning as many as six or seven hundred draught bullocks, and these men save an expenditure of hundreds of rupees every month by steeping rather than boiling their gram. Nor is this all. We have shown above why boiling is positively injurious, and experience amply proves the fact, for it is no secret that cattle fed with steeped grain work better and keep in better condition than those fed on boiled gram. Mr. Robertson's experiments are very valuable, as they reduce this rule to figures, and enable us to measure the benefit gained. He took, for instance, eight pairs of bullocks doing equal work, in fact, yoked together. One bullock of each pair was fed with boiled, and the second with raw gram. They were worked for one month. The weight of the food as given was exactly the same for all. At the

end of the experiment all were weighed, and it was found that those fed on steeped gram were in considerably the better condition, and had gained thirty pounds in relative weight.

The same results occurred with regard to horses, except that some animals appear not to like the steeped food. This, however, is probably a matter of habit. Mr. Robertson gives a curious experiment on his own riding horse. When much out of condition, it was fed with two pounds of ground-nut cake and four pounds of gram, both steeped in cold water. In addition, he received the ordinary quantity of grass. Upon this allowance, the horse throve wonderfully, although the amount of solid food was much under that usually given. Mr. Robertson furnishes a little bill of the cost, and we quote it as a curiosity:—

	Rs.	A.	P.
Groom-cutter's pay	3	0	0
60 lbs. cake, at 90 lbs. per rupee	0	10	8
120 lbs. gram, at 80 lbs. do.	1	8	0
Total monthly cost..	5	3	8

This must of course be taken with allowances, not for Mr. Robertson's veracity, but for his cleverness. We cannot buy gram at 80 lbs. for the rupee; nor, we fear, could we obtain the ground-nut cake at 90 lbs. for one rupee. But add somewhat for these items, and we learn that a horse may be kept in food for about Rupees 6-8, and yet be up to all ordinary work. The ground-nut cake is known to the natives under the name of "poonach," and at the season when the oil is being extracted, can be bought very cheaply in the villages round Madras. Referring for a moment to poonach *versus* gram, Mr. Robertson arrives at the conclusion that his experiments prove "that working cattle (including horses) will keep in better condition when fed on cake *alone*, than they will when fed exclusively on gram. Ground-nut cake can generally be purchased here at a lower price than gram; and the manure made by the consumption of a ton of cake is much more valuable than that made from the consumption of a ton of gram."

Returning to our subject, it appears beyond doubt that we may profitably avoid the expense involved in boiling the gram or cake used for the food of our horses and cattle. We have lately examined the *modus operandi* of one of the chief contractors, a process formed upon a very extensive experience. The raw gram is, after each feeding, put into great vessels and just covered with water, the whole of which should be absorbed. This secures the certainty that none of the nutriment of the seed is wasted by being thrown away with spare water. It is thus steeped for about twenty or twenty-two hours. This done, it is pounded slightly, to ensure that there shall be no hard or unbroken seeds to pass undigested through the system, and thus be wasted. A short delay causes the gram to take up any water that may have been expressed in the pounding, and then all is ready for issue. We venture to suggest but one amendment, or rather addition to this process—that it would be better to chop the allowance of straw and mix it with the gram. This would prevent much waste of food-straw that now becomes spoiled and is rejected, while all home experience proves that the same amount of straw or hay, chopped fine, will go much further than if it be given *au naturel*. The expense of purchasing a chaff-cutter is probably the only reason why this plan has not been more extensively adopted.—*Madras Times.*

BANANA MEAL.

Proceedings of the Board of Revenue, dated 12th June 1871.

Read again Board's Proceedings, dated 24th April 1871, No. 1,706.

Read also the following letter from T. Broughton, Esq., Government Quinologist, Ootacamund, to the Acting Sub-Secretary to the Board of Revenue, dated 13th May 1871:—

I have had the honour to receive Proceedings of Board, No. 1,706, dated 24th April 1871, and also the 1-pound sample of banana meal therein referred to.

The analysis and opinion I have been led to form concerning its value are as follows:—

It was found that the meal contained 13·34 per cent. of water. As this is doubtless a variable quantity, I have analysed the meal in a dried state. It contains thus:—

	Per Cent.
Sugar, gum, and organic acids in small quantity	19·73
Oil	0·93
Albumen	12·21
Starch...	63·65
Cellulose tissue	1·73
Ash	2·75
	100.00

It thus appears that Captain Campbell is wrong in considering it to contain no starch. Had the fruit been quite ripe at the time it was made into meal, it would probably have contained little. The presence of starch is no injury whatever to the qualities of the meal, which is in all respects well prepared and a very wholesome and nutritious food.

Meal has been prepared from plantains for many years, though it has unfortunately, as far as I am aware, never come into the general use of merits.

THE INDO-AUSTRALIAN HORSE TRADE.

The importation into India of horses from Australia, has, for some time past, occupied a large share of public attention in both countries. Various have been the opinions expressed and suggestions offered, as to the best means to be employed in order to do away with the objectionable features of the system now in vogue, and to render it more satisfactory, not only to the Government, but also to buyers of horses individually. It will be remembered, that a few years ago, the Indian Government employed a gentleman as their Agent to purchase horses in Australia, for cavalry remount purposes; but as the expense was found prohibitive, contracts were offered to private dealers from whom it was anticipated the Government would be enabled to procure horses at a much cheaper rate. This step necessarily stimulated competition amongst the dealers and breeders in Australia, and no less than thirteen ships arrived in India at different ports last season solely employed in the horse trade. The attention of breeders in the Colonies having been thus turned to the Indian market as a most advantageous market for the disposal of their stock, they have been encouraged to breed a class of animal which must command a ready sale in this country.

There are at present many gentlemen in the Colonies who devote their time entirely to this business. The breeder's first object is to procure a good stock of Australian brood mares, and suitable English sires, a proceeding which is not only very expensive, but entails considerable risk. Having procured suitable sires, he commences to breed, and as very few horses are shipped to India under four years old, the expenses of rearing are necessarily great. Some persons discharge the duties of both breeders and dealers, by bringing their own stock over for sale in India; but as a general rule, the dealer simply purchases the horses, charters the ship, and takes charge of them until disposed of in this country, and consequently has to depend on the breeder to furnish a suitable description of horse. With a view to this, the dealer must himself be a thorough judge of stock, and well-versed in the mode of rearing, and the duties connected with a breeding establishment. On his arrival from India the dealer proceeds to the breeding station, and having selected the animals he considers best adapted for this market, he has them driven down to Melbourne, and turned into his own paddock, until such time as he can charter a ship at about £12 to £13 per head. Having made the necessary arrangements, such as fitting up the ship, buying the necessary forage, and engaging grooms, and probably augmented his stock by purchasing a few horses at the different sale-yards in Melbourne, he sets sail, and the most dangerous part of his business commences, for from the time he leaves Australia until he arrives in India, he must pay the most unremitting attention to his horses, or otherwise he will lose a considerable number of them. The danger most to be guarded against (putting aside the obvious perils to which the horses are exposed in the event of foul weather) is the colic which is brought on by their being kept so long in one position, and the dealer generally considers himself lucky, if he does not lose more than ten per cent. of the number of animals shipped. When we add to this the risk of slinging, discharging, and landing the horses through the heavy surf on our coast, it is obvious that the dealer engaged in the Indo-Australian horse-trade has many difficulties to encounter before he can realize the profits for which he ventures so much. As an instance of this, we may mention, that on one occasion, a dealer well-known in India lost in one day twenty-seven horses out of one hundred and forty, owing to the injuries received by them during a heavy gale.

Taking every thing into consideration, there can be no doubt that the Indian Government have pursued the better plan in issuing tenders for the supply of horses by private contractors; and if they could only come to some arrangements with the dealers as to the steps to be taken with regard to the grooms necessarily engaged in the trade, and for whom no employment can be found in India, the only objectionable feature in the system would be surmounted. There can be no doubt that well-bred Australian horses are the best animals for this country for all ordinary purposes, and though the Arab, or the half-breed, between Arabian horses and English mares now generally in use in the cavalry may be useful as park-hacks or chargers, still, the cost of keeping up the stud, and the expenses of breeding and rearing are so great, that the price of these animals is disproportionately high compared with that of the imported horses. Australian horses usually requires a larger quantity of food than country-bred horses; but the amount of labour to be obtained from them respectively more than counter-balances the extra expense of feed. Moreover, Australian horses are not nearly so given to vice as are Anglo-Arabians, despite all we hear about "buck-jumpers," and although a few "wonds" may find their way here.

That there are better sires in Australia than have yet been found in India, has been proved by *Panic*, *Fisherman*, and many others. The breed of English horses *i. e.*, horses, whose sires and dams have both been imported, though they may at first realize the expectations of the breeder, will year by year deteriorate both as regards speed and stamina in a hot country like this; whereas horses bred in Australia are well able to withstand almost any change of temperature. It is evident that men must be engaged to take charge of the horses, and it is unfair to expect the dealers to go to the expense of defraying their passages back to Australia, which, in itself, would augment the cost of importation to the extent of some £300 for every ship that arrived here, and so raise the price of stock, as to compel us to pay Rs. 500 for a horse, which otherwise we might get for Rs. 450, or less.—*Madras Mail.*

AGRICULTURAL EXHIBITION AND CATTLE SHOW AT NELLORE AND ADDANKI.

We are by no means surprised to find that in the opinion of those best able to judge, namely, the authorities of the district, the Agricultural Exhibition of Addanki and Nellore in January and February last were very questionable successes; and the Collector, *Mr. George Vans Agnew*, has not hesitated to put the matter in its true light. The Government have allowed his remarks to be published; though the Board remark, that "the more dissemination of the fact that the Collector had no faith in the good effects of such Exhibitions, would, of itself, go far to verify his predictions"—an admission which shews on what a very slender basis these belauded Exhibitions rest. At the Addanki cattle show, the official Judges—the Collector and Sub-Collector—were assisted by the Superintending Engineer, the Superintendent of Police, the Deputy Director of Revenue Settlement, the Assistant Collector, the Assistant Superintendent of Police, a Deputy Collector, a Huzur Sheristadar, a District Munsiff, four Tahsildars, a Sub-division Sheristadar, and a Supervisor, D. P. W.; who were themselves aided by Committees of four ryots each, for four classes of exhibits; so that altogether thirty-two individuals exercised the functions of Jurors. The Collector, as *ex-officio* Chairman, should have considerable weight in such a Committee; but it is hardly likely that his own adverse views regarding the Show would be adopted without criticism by so many persons, with several of whom he has no official connection. Indeed we should incline to the opinion that with respect to a pugnacious and dogmatic Collector, the opposition would be very lively, were there any necessity for it.

The number of animals exhibited this year, compared as follows with those exhibited in 1870 and 1869:—

	1871	1870	1869.
Full grown bulls	6	8	10
5-year-old bulls	6	10	11
4-year-old bulls	17	15	19
3-year-old bulls	21	30	14
2-year-old bulls	19	23	30
Yearling bulls	31	25	..
Bull-calves	30	18	..
4-year-old heifers	18	31	28
3 year-old heifers	21	31	30
2 year-old heifers	18	27	23
Yearling heifers	33	13	..
Heifer calves	12	17	...
Working cattle pairs	11	12	..

Thus, with two exceptions, the number of beasts showed a marked falling off this year, though the prizes had not been reduced, and though last year was, on the whole, a favourable one for the ryots. The competition of full grown and 5-year-old bulls was almost nominal. The exhibition of 4-year-old, 3 year-old, 2-year-old, and yearling bulls was very good, and the competition brisk. The bull calves shewn were a fair lot. The full grown cows were of good quality, but few in number. To the 4-year-olds, the three prizes were awarded to the three animals exhibited. The show of 3-year, and 2-year-olds was very good; and of yearlings the exhibition was very satisfactory in point both of numbers and quality. There was a close competition among heifer calves; but the show of working cattle and country ponies was unsatisfactory, the latter being mostly "a wretched lot." Of 4-year-old colts none were entered, but two 2 year-olds were exhibited. The "mares were not so utterly bad as the previous classes," and the class of fillies "was about on a par with the previous one—the mares," which was probable, as fillies usually "take after their mamas." But as a whole, the Committee do not consider the present show to have been altogether a successful one. The prize-animals they believe to have been fully up to last year's mark, and in the quality generally, of the cattle on the ground, no falling off was noticeable; but only some 250 were exhibited against over 300 in 1870. This decrease, the Committee attribute partly to the circumstance that during a considerable part of last year an enormous impression was abroad that no shows would be held in 1871. They suggest that in view of the comparative failure this year, it might be well to hold the next annual gathering at Ongole, in preference to Addanki, to afford Nellore breeders the opportunity of competing.

As to the Nellore agricultural show the local Committee record their opinion that the result was discouraging. The horned stock belonging to the principal division were, with almost a single exception, "unworthy of exhibition;" the "show of sheep and goats was miserable;" no sign of improvement in the breed of ponies was perceptible. In agricultural produce, with the exception of saltpetre and salt, there was a falling off in comparison with previous exhibitions; and in "agricultural implements no effort whatever at improvement was observable, but rather the contrary." They urge, however, "under this discouraging state of things," that Nellore may have yet one more show, and they recommend certain modifications as to the conditions of competition.

The Collector, with sublime disregard for the feelings of the Board of Revenue, and in a less degree of the Government, cordially endorses and enlarges upon the unfavourable verdicts of the two Committees; and with a refreshing candour, rather unusual in the proceedings of the Board, he acquaints that sublime abstraction with the fact that the Addanki show was his first experience of the kind in this country, and from what he saw and learnt, the impression left upon his mind was that "this show, like those that have preceded it, probably effected some public good, but only in a limited degree; and that future shows, while continuing to effect the same moderate measure of good, are, for an indefinite period only likely to do so within the same rather restricted limits." It "remains to him a doubtful question whether the amount of public good that has been, or is likely to be produced by a show of this sort, is commensurate with the cost of obtaining it." His experience of Indian agriculturists "renders him altogether sceptical in regard to the possibility, within any definite period, of forcing them either by precept or example appreciably beyond their customary grooves of action." He believes that competition is restricted to a narrow circle of villages and individuals, some of the latter being capitalists and large breeders, who treat a few of their beasts exceptionally well, while the rest are "men of no mark or substance, who buy and rear a good beast or two with a single eye to speculating therewith for the prizes at the show." "The great bulk of their cattle, together with all the cattle not owned by this small clique, remain exactly what they would have been had no shows been instituted." In the "end a good deal of public money is very easily obtained by a few individuals, and anything like general improvement in the breed of cattle is, in his opinion, neither effected nor to be expected." He admits "the good consequent on the production of this small number of animals of superior excellence, but the question recurs, is the attainment of so much or so little good worth all the outlay of past years, and should public money continue to be spent in the attainment and maintenance of just so much and no more public good." He adds that "so many sanguine expectations have been hitherto indulged in, and so many encomiums have been passed upon these cattle shows, that he does not flatter himself that much weight will now be attached to his remarks," and he has performed the "invidious task of recording them, because the subject involving a considerable expenditure of public money, it was his duty to state the opinion he had formed." He mentions that in this opinion he is authorized to state that Mr. Thacker, the Veterinary Surgeon on special duty, entirely concurs with him. The Nellore Agricultural Exhibition, putting altogether aside the northern cattle, has, as far as he can judge, never been a real success, and "except under the provocation of a gubernatorial visit, it is no use attempting to disguise the unmistakeable fact that the district nobility do not care a button for agricultural exhibitions." Mr. Vans Agnew confesses that he "is not sanguine enough to anticipate—he won't say genuine, independent, sustained interest, but any sort of interest on the part of the principal land-holders in the Nellore Exhibition, except when the same may be patronized by the Governor in person."

But the Board will not surrender. They remark that they "have so frequently expressed their opinion with regard to the influence for good that must ultimately be effected by these shows, that it is scarcely necessary for them to say that they are not disposed to give them up at once in deference to Mr. Vans Agnew's adverse judgment on them." "It was never considered of importance that the ryots of this country should take an interest in exhibitions merely *as* exhibitions; and it is even probable that the actual number of exhibitors may continually decrease, as the reputation of particular individuals becomes more widely known; but this again is a matter of no consequence whatever. Very few of the owners of cattle even in England breed with the object of improving cattle *generally*, but simply to get prizes first, and then in consequence high prices for their cattle, and the number of exhibitors as compared with the total number of breeders is extremely limited even there." The Board see plenty of reason to justify the comparatively trifling expenditure on the Addanki show that has been incurred from the beginning of Rs. 18,201 in all. They notice tendency to *illiberality* in the distribution of prizes at Nellore, which they think is to be deprecated as likely to create

a feeling of uncertainty as to the money promised being actually given, and also as to the continuance of the shows, and consequently a still greater reluctance to come forward on the part of exhibitors. Looking carefully at the prize list they do not even agree in considering that the Nellore show was so wholly discouraging as it is represented by the Collector and the Committee. And the Government concur with the Board in thinking that the results attained by these cattle shows are by no means so discouraging as they appear to Mr. Vans Agnew. The shows and prizes "have probably" exercised a much wider influence in improving the breeds than is readily apparent. The Board are to call upon the district officers "to make inquiries during their Jamabandi tours, on the subject, especially as to whether prize-stock are valued and in demand for their produce; whether any greater care is now taken in selection of sire and dam; whether the young stock are better fed and cared for; whether fodder is especially grown for summer use, &c." After what the Collector has said, it is rather superfluous to order the district officers to make further inquiries, unless it is to be supposed that Mr. Vans Agnew has recorded his opinions without taking the trouble to test them by comparison with the views of his neighbours. On this occasion, we believe, he has expressed the popular feeling in his district, which is based on practical results, while the Board and the Government hope for the best in the teeth of those results. But the expenditure is not very large, and we think the Government act wisely in sanctioning its continuance, in preference to ordering, on the score of economy, the abolition of two exhibitions which cannot be wholly useless. At any rate we had rather see the money spent in prizes for the benefit of ryots of a speculative turn of mind, than placed at the disposal of the Department of Public Works, second division. For revenue purposes also the money is well spent, if it results in youthful Assistant Collectors being enabled to discern the difference between the Indian sheep and Indian goat, and to learn the contour that commands the respect of the wise, in the bull, cow, calf, and *goose*.—*Madras Mail.*

CATTLE DISEASE, NORTH-WEST PROVINCES.

Revenue Administration Report, N. W. P.—The Board's Report tells us that cattle disease has prevailed extensively in Bulundshuhur, Banda, and Bareilly. In Bulundshuhur and Banda both forms of the plague, as prevalent in the North-West Provinces, were observed. In Bulundshuhur 6,293 cattle were attacked by the foot and mouth disease, and one in every ten died; 5,776 suffered from "vedan," and nearly one-half of those attacked perished. In Banda 297 head of cattle died out of 706 attacked by "vedan," and out of 744 afflicted with the mouth and foot disease, only one was lost. No statistics are given about Bareilly, but we are told that the district has suffered greatly from cattle disease in a form called by the natives "vedan" or *nandbhaon*. Benares and Futtehpur also suffered slightly, but not so as to call for any special remark.

The above is all that is of importance in the report given, and nothing can well be more meagre. In none of the districts where it prevailed do any remedies seem to have been used, or efforts made to watch and control the spread of the disease. It would seem that the Collectors, from the tenor of their reports, as quoted, were as much fatalists in the matter as the people, and looked upon the disease as a mere matter for record. It is rather singular and noteworthy that in 1868, when this epidemic first pressed itself on the attention of the Government, N. W. Provinces, and it was deemed advisable to report upon it, that Benares, Futtehpur, Bulundshuhur, and Bareilly, were four out of the twenty districts that escaped that year with perfect immunity. Banda alone of the five suffered in those days. The popular theory to the present day about "vedan" is that it attacks cattle located in low marshy ground, and if this were true, we should expect to find it raging with virulence in Mozuffernuggur and Saharunpur just as it did in 1868. Those districts are water-logged enough to satisfy all requisitions of damp and swampy grounds. We are inclined to take exception at the way in which it has been pre-judged that this "vedan" is the rinderpest that devastated England and the Continent. At present appearances are against this conclusion, and hence to pre-judge the matter cannot but be wrong. It is moreover harmful, for these wrong premises lead to wrong inferences, and this is singularly instanced in the case at Bulundshuhur. The Collector has fixed in his mind that the epidemic is the rinderpest, and therefore that there is but one remedy, segregation or stamping it out. He has overlooked one essential point in which this "vedan" differs from the rinderpest of Europe. In India it is not necessarily fatal to all its victims; in Europe not one really attacked ever recovered. The reports in 1868, though very dark, were in almost every case tinged with a silver ray of hope. Nearly one and all pointed to the fact that the cattle cared for suffer least, and that recoveries were possible. This fact would be placed beyond all doubts, if only European supervision were concentrated, while the plague was raging in one of the affected villages. Separation of the infected cattle is not impossible; it has been tried in the middle of an area where the plague was raging, with a very fair amount of success. Bulundshuhur presents many opportunities for such supervision; scarcely a single district in the North-West has so many houses habitable for Europeans out in the district as it has. When the plague next appears, let any English officer who takes an interest in the matter, and has the confidence of the people remain on the spot while the plague is raging. Let him separate all diseased cattle suffering from foot and mouth disease, follow the treatment given in pages 98 and 99 of Government Record Selections, No. 69, and in lieu of 620 being lost, under proper care not one will perish. There is nothing at all even remotely fatal in this disease if checked at the commencement. The treatment of "vedan" is more difficult; here, too, separation is essential, the cattle should be kept carefully clean, the animal's strength kept up by frequent drinks of *boosie* and water, or *suttoo* and water; rice and water is also very successful sometimes, and the remedies given in pages 100 and 101, of the above quoted report, should be given as they seem to suit. Intelligent natives too can suggest much. We have not a doubt that if care and energy had been shown when the disease broke out at Bulundshuhur, the recoveries would have been in greater number than even at Banda, and at least three out of every four head of cattle saved. And all this without producing that result so much dreaded by the Collector—the "putting a stop to commerce and traffic of every description."—*Pioneer.*

TOBACCO.

The following interesting report on tobacco cultivation in the Madras Presidency has been placed at the disposal of the Press.

Referring to Government Order No. 1,606, of 21st October 1870, in Revenue Department, I have the honour to give a report on the large number of specimens of tobacco I have received, and on the general question of tobacco cultivation in South India.

The specimens received have been very numerous, and comprise apparently all the good indigenous tobaccos grown in this Presidency. As the best mode of analysis of these has been a subject of much consideration with me, I will first append a tabular statement of the results I have obtained after much thought of the various points on which information was necessary. It will be perceived that the list comprises nearly every possible variation in the amounts of the constituents determined by the analysis. To these results I append the numbers yielded by the Shiraz tobacco grown in Tanjore, received from Revenue Board, and those obtained with some cigars given me by Dr. Ross here, and which are referred to in Board's Proceedings, No. 6,619, of 12th November 1870:—

Number.	Tobacco specimen from	Per cent. of Ash.	Per cent. of Carbonate of Potash in Ash.	Percent. of Nicotine.
1	Vizagapatam,—Vizagaparam, No. 1, 1st sort	22·653	12·5	1·41
2	Do. do. No. 1, 2nd sort.	20·185	17·83	1·45
3	Do. do.	26·339	3·20	2·45
4	Do. Chiparapilly, No. 2	17·544	9·6	2·37
5	Do. Aukapilly, „ 3	18·592	8·01	5·40
6	Do. Srungavarapukota, No. 4 ...	20·740	9·91	5·49
7	Do Vizianagram, No. 5	20·411	7·2	4·54
8	Trichinopoly,—Trichinopoly, A ...	22·829	6·05	2·52
9	Do. do B ...	21·485	8·16	2·41
10	Do. do	24·434	5·29	1·83
11	Do. (Cigars) Talamputty Pulvor...	20·396	8·25	3·28
12	Do. (Cigars) Natapur	20·648	4·42	4·55
13	Do. (Cigars) Valicundapuram .	23·108	3·91	4·15
14	Bellary, Hospet	19·033	8·46	3·74
15	Do. Raidroog	18·931	13·29	1·70
16	Do. Harpanhully	20·29	3·75	4·99
17	Do. Sundoor	20·114	4·40	2·41
18	Nellore, 1st sort.	19·422	8·12	2·16
19	Do. 2nd sort.	18·606	5·81	1·83
20	Cuddapah, Pullampet, A.	20·701	4·62	2·03
21	Do. do B.	20·507	3·45	1·33
22	Do. Sidhout, C...	23·951	4·07	2·99
23	Do. Budwall, E...	22·453	3·71	2·70
24	Do. Chinnia Dundloor, G ...	16·255	4·11	5·1
25	Do. Prodatoor, H., No. 1 ...	21·698	4·49	2·75
26	Do. do I. „ 2 ...	16·432	6·15	4·82
27	Do. Jammalmadagu, J... ...	22·105	3·52	5·07
28	Do. do Pommatolah, K.,	17·327	5·93	5·36
29	Do. Madanapully, P	18·743	5·95	7·44
30	Do. do Q, 1 ...	20·18	2·28	7·23
31	Do. from Board of Revenue...	24·75	4·30	1·70
32	Tanjore,—Tanjore	20·745	8·71	2·49
33	North Arcot	22·895	10·00	4·40
34	South Arcot, Ravathavallur	21·115	11·92	3·80
35	Nilgiris, Todanaad	20·596	29·26	1·44
36	Do. Koondahs	17·786	6·37	2·05

Number.	Tobacco specimen from	Per cent. of Ash.	Per cent. of Carbonate of Potash in Ash.	Per cent. of Nicotine.
37	Kurnool, Nundial (masub soil) ...	4·030	4·31	1·41
38	Do. do. (ragud soil) ...	22·535	0·78	2·49
39	Do. do. (local soil)... ...	16·85	9·89	1·33
40	Do. Markapur...	22·767	3·89	2·45
41	Do. Cumbum	19·22	9·77	1·87
42	Coimbatore,—Coimbatore	22·856	2·94	3·32
43	Do. do	22·606	5·64	4·95
44	Do. do	19·023	7·92	4·90
45	Do. Pullachy	24·987	4·39	1·95
46	Do. Moocasipoodoor	25·73	7·67	2·24
47	Do. Coorchy	26·39	7·93	1·17
48	Do. Poonderay Semoor ...	23·34	2·65	1·20
49	Do. Aval	23·49	19·97	1·46
50	Do. Monigumpollium ...	26·65	2·61	2·95
51	Shiraz tobacco from Tanjore... ...	22·86	2·99	1·91
52	Cheroots supplied by Dr. Ross ...	28·50	0·39	2·04
53	Do. made from Shiraz tobacco grown at Tanjore ...	25·68	5·98	1·67

With respect to the above analysis and to the determination of the above particular constituents some remarks are required. According to our present knowledge, the quality of tobacco, unlike substances where excellence depends on the preponderance of a special or a few special constituents, cannot always be inferred from an analysis, however complete it may be. It would be absurd to conclude respecting the quality of wine, for instance, from an analysis stating the percentage of spirit, sugar, tannin, etc., such as could be easily made. Those numbers would give no information whatever as to flavour, age, and other qualities, upon which the goodness depends, and would throw no light whatever on the still slighter variations of quality which appeal more particularly to the tastes of individuals: as with wine, so with tobacco. Chemistry, according to our present knowledge, cannot indicate the constituents or the proportional amounts which shall cause the results of burning it in an incomplete manner to possess the greatest excellence of flavour; it can only lay down the broad proportions in which certain constituents must occur to produce this excellence. But those proportions may actually occur in a tobacco, and yet the greatest excellence of flavour may possibly not follow.

What is usually called the strength of tobacco in smoking, depends immediately on the amount of contained nicotine. A tobacco that contains over four per cent. of this powerful alkaloid, is a strong intoxicating tobacco, while that which contains less than three per cent. is called mild. It has been found, as an invariable result of experiment, that the finest tobaccos: as the Havanna, Manilla, Cuban, and others, do not contain more than 2 to 3 per cent. of nicotine. To this result there is no exception that I am aware of, though of course by the constant custom of smoking strong tobaccos, a few persons may even become so as to prefer it to the finer kinds. These exceptional tastes do not interfere with the otherwise universal currency of the rule. It is remarkable that among the numerous Indian tobaccos, I have but found two instances in which as much nicotine is found as in Virginian or French tobaccos, where it amounts to nearly 7 per cent.

Another important constituent of tobacco of high quality is the organic salts of potash. As these, in the burning of tobacco, become converted into the carbonates which are found in the ash, I have therefore in each case made a determination of the amount of carbonates of potash in the ash of the specimens. The whiteness and permanency of the ash of a cigar depend entirely on the amount of potassic carbonate it contains. The presence of potash salts certainly modifies the burning of tobacco in a peculiar way to the improvement of its flavour, and also positively facilitates its burning. It will be familiar to the experience of every smoker in this country how far more difficult it is to retain a light in a country cheroot, with its grey scattering ash, to the white coherent ended Manilla or Lanka. These remarks appear trifling; but it is on these trivial matters that the quality and value of tobacco for smoking depends. Organic salts of soda are practically absent from tobacco.

Nitrates are found in occasionally very considerable amounts in all tobaccos, and especially in those of this country. Though they effect the combustibility of the tobacco very considerably, they have a far less influence in this respect than the organic salts of potash. It has been shown by M. Schloring, Director of the late Imperial tobacco works in Paris, that the presence of nitrates in quantity has no connection with the quality of the tobacco. I have therefore not made any estimation of the amounts of nitro present in the specimens received.

An examination of the table of analysis on the principles enunciated above, shows that Nos. 1, 2, 4, 7, 8, 9, 11, 15, 18, 32, 39, 41, and 46, possess in the main the qualifications necessary to tobacco of good quality. It is to be remarked also that the tobacco of Vizagapatam and Trichinopoly are, as a whole, of better quality than those of other parts of South India—a fact also of experience. Bellary, Nellore, Tanore, Coimbatore, and Kurnool, also contribute single specimens of tobacco of good quality, though Nos. 15, 39, and 41 possess, on actual smoking, a far too strong and pyroligneous flavour, to be agreeable to a smoker unaccustomed to the tobaccos. Tobaccos Nos. 35 and 36 furnish important examples of how it is possible, by special culture, to modify the constituents of a tobacco-ash. It is well known that the soil of the Nilgiris is exceedingly poor in salts of lime to a very exceptional degree, while from the decomposing felspar, it is comparatively rich in potassic salts. The analysis show that the tobacco grown on these hills, yield an ash, in which the ordinarily occurring calcic carbonate nearly entirely replaced by potassic carbonate, so that in one specimen the latter substance occurs in the ash to the large amount of 29·26 per cent. Though the cultivation of tobacco on these hills is of the roughest possible kind, and produces consequently a most inferior product, I cannot but consider the result now mentioned, as most important and suggestive.

I have received with the specimens of tobacco, in many cases carefully collected specimens of the soils on which they were grown. I have examined these, and find in all cases considerable amounts of calcic carbonate. The presence of this substance in abundance, in connection with a comparative absence of potassic salts, must inevitably cause the ash of the tobaccos to abound in calcic carbonate, and thus depreciate its quality. I am quite of opinion that it is this cause which produces the general inferiority of Indian tobaccos. An examination of the first fifty of the analysis given shows that thirty-nine kinds contain less than nine per cent. of potassic carbonate in their ash.

But with ordinary European smokers, from whom the English and Continental tobacco markets exist, and who are accustomed to the use of the fine foreign tobaccos of even good quality, would be found agreeable. It is stated in a memorandum of Dr. Hooker's, published in the *Nilgiri Gazette* of April 19th 1870, that he was informed by the brokers "that the Indian and Colonial tobacco is very poor indeed." A slight apprenticeship is always necessary before Anglo-Indians relish even the finest Indian cheroots, though custom subsequently brings a full appreciation of their good qualities. For export it therefore appears necessary, that not only should the tobacco be of good quality, but that it should also be of the very kind to which the market is accustomed. In other words, the kind of tobacco exported should not be of the Indian, but of foreign varieties. If Indian tobacco be exported, it should be most carefully selected; and against this the fact remains, that there is in this country a most ready sale for the better kinds, and consequently with them there is but little profit in export.

In Proceedings of Board of 12th November 1870, No. 6,619, enclosure No. 2, Dr. Ross describes the growth of some Ohio and Shiraz tobacco. He has been good enough to give me a few cheroots made of the tobacco. Though they contain the amount of nicotine found in the best specimens of tobacco, they are abominable in flavour. Their ash is black, and contains but 0·39 per cent. of potassic carbonate. This is the cause of the bad quality and black ash. The tobacco was grown on soil rich in lime salts, and was not manured with manures rich in potash.

It is quite certain that the finest foreign tobaccos will not yield a good produce in most parts of South India, unless carefully and systematically cultivated.

The tobacco from Shiraz seed, which I received from Tanjore, is of better quality, but it is undoubtedly affected by the small amount of potash salts in the soil in which it was grown. Had the soil been manured with the ashes of plants, this tobacco would doubtless have been of fine quality. As it is, the ash is not good, and the flavour, though not bad, is not equal to that of real Shiraz.

The cheroots made from the Shiraz tobacco are much better. Whether grown on different soil, or from some local cause, they are an improvement on the latter specimen. Their ash contains 5·98 per cent. of potassic carbonate, and the tobacco somewhat less nicotine. The cheroots are good, of pleasant flavour, but are too new to have reached their best flavour.

In consequence of the directions issued by the Board, I have received full accounts of the method of cultivation and curing of tobacco. The former does not appear to differ much in various parts of South India. From Nellore, North Arcot, Coimbatore, Trichinopoly, it is very significant to learn that tobacco is improved in quality by being watered from brackish wells. But the method of curing differs greatly both in the manner in which the tobacco is fermented, and the duration of time during which it is exposed to fermentation. Though these variations doubtless have considerable influence on the flavour of the tobacco. I have had no experience on their effects, and can only state my conviction that the method of curing which produces the best tobacco, will be found the best to employ, as it is the most simple. The sprinkling with water containing jaggery and the

bark of acacia arabic can hardly fail in being both useless and injurious. One or two specimens of tobacco which I have received were spoilt for smoking to an English palate by the amount of jaggery they contained.

In order to cure the very general defect of Indian grown tobacco, I would strongly advise that the plots of ground on which the foreign tobaccos are grown should, in addition to cattle manure, be also manured with the ashes of wood or plants. If these could be prepared by burning on the ground it would be better. I find it is customary in Manilla to do so, and it was a result of M. Schlosing's experiments in France, that this treatment increased the amount of potash salts in the tobacco. I have no doubt whatever that by this treatment tobacco of the finest quality could be grown in India.

From what I know of the soil of Wynaad, I have a strong conviction that it would be well-suited to tobacco cultivation. Like the soil of the Nilgiris, it contains but little calcium salts and much potash. Wynaad possesses also a climate which appears very favourable to the plant.

The large amount of ash yielded by tobacco fully explains why it is an exhausting crop. The elaborate arrangements customary in Trichinopoly for its manuring doubtless are a cause of the high local reputation of the tobacco there produced. Poor soil and lax cultivation will never produce good tobacco. In all places where the tobacco has a reputation, it appears that much care is taken both to manure it highly and to cure it with great attention after it is harvested. Unless this be done, it will be useless to expect favourable results in India, or anywhere else.

I shall be glad to receive tobacco grown from foreign seed for analysis, as soon as that grown near the Horticultural Society's Gardens, Madras, and on the Government Experimental Farm, is ready. I should much like to compare the results of tobacco manure with that grown without manure; and also some grown with a plentiful manure of plant ashes, with that grown on a small plot unmanured.

The acknowledgments of the Board are due to Mr. Broughton for his masterly and interesting report above recorded, which will be communicated to Government, with a suggestion that the report be as extensively published as possible.

The attention of the Superintendent of the Government Farm is drawn to Mr. Broughton's remarks in the last paragraph of his letter.

The result of the experimental culture of tobacco at the Government Farm, desired by Government in their Proceedings, Revenue Department, 21st October 1870, No. 1,606, will be communicated as soon as known.

Order thereon, 27th July 1871, No. 1,313.

Ordered, that Mr. Broughton's report be communicated to all other Indian Governments and to the Governments of Ceylon and the Straits' Settlement, and that copy be forwarded to the Secretary of State.

The report will also be laid on the Editors table. The Government concur in the Board's estimate of its value.

The Foresters' Gazette.

BOMBAY, 21st AUGUST 1871.

COMPARATIVE ANALYSIS OF TIMBER.

To the Editor of the Madras Standard.

SIR,—Since my last, I have been carefully turning over in my mind, the value and importance of establishing a comparative analysis of timber grown in various parts of India. That much valuable timber of various sorts grown in India is fully shown in the annual reports published under official authority by the Conservators of Forests in Bengal, Burmah, the North-Western and Central Provinces. But it has not yet been proved which Presidency can fairly claim the reward of merit for the quality of its timber. In the one item of teak, Burmah boasts of having carried off the prize, though I do not see why it should be so, for there is as good teak produced in the North-Western and Central Provinces; and much may also be said in favour of that which is grown in the Mysore districts, and in Malabar and Travancore. The fact is, this matter must remain doubtful until a comparative analysis of timber grown in India has been fairly established. This can be done only by collecting samples of teak and other valuable timber grown in various parts of India, and of the same periods of growth, and putting them under the strictest tests. The result cannot but be interesting both to Government and others engaged in the trade of carrying and importing timber, and in the manufacture and sale of useful household furniture, &c. I think this matter may be considered as one of great importance, and should accordingly be taken up by Government as an experiment most valuable to its own interests, inasmuch as Government has now become the owner of much forest land which is being constantly kept, as it were, on the stretch, for the supply of railway and other materials, by which its revenue is being annually increased, in spite of the great expenditure rendered necessary for its efficient supervision. If the Government takes the matter up earnestly, I have no doubt many merchant princes and others, in some one way or other, interested in its results, will come forward and aid Government in its efforts to arrive at satisfactory conclusions, not only as regards the quality of timber, but also as regards the localities and soil wherein valuable timber can be profitably grown. With this end in view, instructions might be sent to the various Conservators of Forests, and to all private owners of forest land throughout India, Mysore, and Burmah, to select good teak and other valuable timber, of from 50 to a hundred years' growth, and forward them to some central depôt, with particulars regarding soil, climate, and locality, taking care to place distinctive marks on them, to enable assessors to use their experience and judgment towards arriving at satisfactory conclusions, both impartially and without any excuse for indulging in any inclination for forming invidious distinctions. One out of many good results produced by such an experiment would be the establishing once for all the fact where and in what part of India the best timber of sorts is procurable, which will not only remove the differences which at present exist in regard to this matter, but will also point out clearly the exact localities where extensive plantations may be formed with profit and benefit to the state and country, and in that way increase the knowledge of all interested in the growth of good and valuable timber throughout India. It may be, too, that our despised Presidency will thus get an insight into the quality and value of its own timber produce, and be thereby tempted to throw in a sop for the Cerberus who guards the gates of our almost palatial forests. He has done much, but not enough fully to satisfy us. A word therefore for the wise is sufficient.

W. H. T.

TIMBER TREES.

To the Editor of the Madras Standard.

SIR,—I, the other day, met with the following statement regarding timber trees amongst the "varieties" of a very old periodical:*—

"Experiments lately (1832) made on the comparative strength of different kinds of wood, throw new light upon the subject of timber trees, and lead to the most important conclusions. They prove not only that fast growing timber is superior in quality to that of slower growth, but that by the constant application of manure to the roots of trees, planted even in good soil, nearly double the quantity of timber may be obtained in the same period, while its strength instead of being diminished will be thereby increased.

This, Sir, is quite against my own, more than 18 years' practical experience of timber and other trees. It is against truth. It is against nature. It is against all the facts accumulated during recent years in our gardens and forests. Of course, I cannot enter particularly into the merits of the experiments referred to, as I have no data to go by. Much doubtless depends upon the nature of the wood employed and the climate and place in which it is grown. I can, therefore, have nothing to do with the experiments themselves; but I emphatically deny that "fast growing timber is superior in quality to that of slower growth." "Facts," they say, "are stubborn things," and so it is in this case. Go to England and compare the oak with the chesnut and elm; go to America and try the merits of the maple and mahogany with blackwood; go to California and weigh the worth of the huge primeval forest trees which have grown there for hundreds of years with the fast growing foreign trees that are being tried there; go to Australia and study the monstrous *acacia* found in its solitudes; then come back to India and look at its teak, its kowah, its tamarind, palmyra, mango, and jack, and say if this idea is a fallacy or not? You need not go to the bottom of the well to search there for truth, it is clearly apparent on the very face of these things. For instance, the oak is of the slowest growth, and yet it is the strongest and best wood in all England. In America, next to the oak, there is nothing comparable to the blackwood that has been allowed to stand out for a hundred years or so, and as for California, the value of its timber has become proverbial; while the Australian *Eucalypti* somewhat slow of growth, are acknowledged to afford the best timber for building purposes, and are therefore being actively acclimatized in most of our own forests. Throughout India again the teak, the main prop of the east forests of the Northern and Central Provinces, is of such slow growth that it is not considered as worth much under 100 years' growth, and it is so strong that almost anything can be made of it. I my-

* The Christian Observer, January 1832.

self was witness of the astounding fact of several elephants having been made constantly, for over a month, to walk over 3 inch planks thrown across a nullah, 14 feet wide, without producing any strain or crack in them. Compare also our own cocoanut and palmyra, the former coming to maturity in less than half the time that it takes the latter to acquire its productive powers; that one is worthless for its wood, whereas, of the palmyra we are all familiar with its uses. Indeed, I could carry the comparison to a much greater length; but I should think what I have stated is quite sufficient to show the fallacy of the idea that *fast growing timber is superior in quality to that of slow growth.* You could sooner change the nature of the wild beast by feeding him upon plum porridge or bread and butter, than you could the nature of forest or other timber trees by simply stimulating them constantly with manures. Nature will not, in these cases, yield up a title of her prerogatives marked out as they have been by the hand of primordial destiny, and if she *seems* at first to do so, the result is evident—disease, in the shape of a rapid dry-rot after having been cut down, or a multiplicity of grubs while living. Let us, therefore, hope for the sake of truth and nature, that more recent experiments will lead to the exploding of such ideas as that I have here been combating.

As regards manure for our timber trees they are at present eschewed as hurtful, except for very young plants that require fostering before being put out. Only wood ashes in extreme cases and sand to open up heavy soil to enable the tender roots of saplings to permeate through, are all that are now employed. In all other cases, nature is left to herself, and thus let alone, she certainly helps herself wonderfully in more ways than one. Of course, care should alwys be taken in selection of ground for forming timber plantations suitable to the *nature* of the trees; to be grown thereon, and this may always be perceived from the character of the surrounding growth. Hence, indiscriminate planting has its drawbacks, and it is seldom remediable afterwards.

W. H. T.

REVENUE FORESTS, *the 23rd June* 1871.

It having been brought to the notice of the Chief Commissioner that, unnecessary delay and inconvenience are caused to the general public, by the terms of para. 2 of Notification No. 136, of 13th July 1870, which limits to the Conservator of Forests, the right of granting permission to sell and remove wood growing on kandhyem lands, this right will now be extended to Deputy Superintendents of districts and Assistant Conservators of ranges. The following regulations are accordingly published for general information, in supersession of Notification No. 136, of the 13th July 1870.

All amildars, and subordinate revenue authorities, and the public in general, are hereby informed that under the provisions of the 3 1684 rules, no seigniorage is chargeable on the felling of any bamboos or trees of any kind (excepting sandal-wood and teak), when such trees or bamboos have been planted by the present holder of kandhyem land of any description, or by his own immediate ancestors, or by the former occupant of the land, from whom the present holder may have legally purchased the pattá rights, when such trees or bamboos are required for his own use.

The operation of this exemption is, however, subject to the general rule that when a man, entitled to the enjoyment of such trees standing on land over which Government has certain proprietary rights, wishes to sell them, he shall first apply for permission to the Conservator of Forests, Assistant Conservators in charge of the ranges, or to the Deputy Superintendent of the district, and obtain a free passport for the removal of the wood.

All officers giving such permission should, before granting the passport, ascertain that the wood is legally the property of the applicant, and care must be taken that all time-expired passports are returned to the issuing office.

Official Gazette.

BOMBAY, 21st August 1871.

EXPERIMENTAL FARM—MADRAS.

REPORT ON HORSE GRAM (KOOLTEE) DOLICHOS UNIFLORUS, CULTIVATED AS A GREEN FODDER-PLANT UNDER DRY CULTIVATION.

This plant belongs to the order Leguminose, the order which includes beans, peas, vetches, and clover. It is a hardy plant, and thrives on the poorest soils.

The soils of this district contain a very small proportion of lime; and this plant, like all leguminous plants, requires a good deal of lime before it can mature its seed. It has been ascertained from experiment, that unless the manure applied contains a considerable percentage of lime, the tendency of the plant under better cultivation *is to produce leaf* rather than seed; this tendency has been utilised, and by deeper cultivation and the application of a moderate dressing of manure, we have succeeded in growing good fodder at a very moderate cost.

During the past eight months on this farm, we have cultivated nearly twenty acres of gram, simply for green fodder, and, though the weather during the past six months has been extremely dry, the results have considerably exceeded our expectations. In proof that our circumstances are not of a favourable character, I need only mention that our soil contains eighty-nine per cent. of sand; and that, with the exception of a shower on the 17th February, we have not had a drop of rain during the past sixteen weeks. Our first crop was sown on the 3rd of August; we commenced cutting this crop on the 13th of October; the yield was 10,642 pounds, or 4 tons 15 cwt. 8 lbs. per acre. No manure was applied in this instance, as the soil was in good condition. The crop was ready for cutting at least two weeks before it was harvested; the actual time required in coming to maturity was, therefore, only two months. During showery weather, the crop reached maturity, in six or seven weeks; from the results of my experiments during the last eight months, I am convinced there is no difficulty in this district in growing four crops between the 1st of August and end of April.

In preparing the soil for the gram, we proceeded as follows:—Ploughed 5 or 6 inches deep, harrowed across the line of the plough; spread about 5 tons of manure per acre broadcast over the land; ploughed in the manure, and then levelled the plough-furrows with the chain-harrows. The seed was then sown in lines, varying from 18 inches to 24 inches apart, according to the season and quality of the soil; if the season was unfavourable, and the soil poor, we placed the lines closer together; if the season was favourable, and the land in good condition, we placed the lines further apart. We sowed the seed at the rate of from 30 to 40 pounds per acre. After sowing, the chain-harrows were passed over the surface, and covered the seed. One application of manure will suffice for the four crops. It is necessary to hoe the crop during its growth. We found two bullock-hoeings, and one hand-hoeing, sufficient for each crop.

The crop should be cut immediately the flower appears, and removed from the ground at once; the land should then be ploughed and re-sown on the same day. It is very necessary *to sow immediately after ploughing*, for, if the moisture is allowed to escape, the gram will remain a long time in the soils before germinating. Once get the gram above ground, and the crop is comparatively safe.

When cut, before maturing its seed, the cultivation of gram improves, rather than impoverishes the soil. True, there will be a slight loss in the mineral constituents of the soil; still, as this plant appropriates such a large amount of atmospheric food, and stores it away in its roots, and as these roots, weighing from 800 to 1,000 pounds per acre, are left in the soil, its condition must be improved.

The crops grown during the past three months did not yield so much fodder as those grown during or immediately after the rains; however, they yielded:—

7,582	pounds	per acre.
6,069	do.	do.
4,855	do.	do.
6,180	do.	do.
5,614	do.	do.

or 6,200 pounds per acre. As I have previously stated, we have grown crops that *yielded fifty per cent. more fodder*, and I might fairly record the average for the whole season at twenty-five per cent. above this result; however, I prefer taking the lower figure in my calculations as the more certain.

The cost of producing one ton of gram-fodder is as follows:—

		Rs. a. p.	Rs. a. p.
First crop.—1 Ploughing.		1 0 0	
1 Harrowing		0 2 0	
5 Tons of manure		5 0 0	
Spreading manure		0 2 0	
1 Ploughing		0 12 0	
1 Harrowing		0 2 0	
35 Pounds of seed.		0 12 0	
Sowing		1 0 0	
1 Chain-harrowing		0 2 0	
After cultivation.			
2 Bullock-hoeings.		1 8 0	
1 Hand hoeing		1 0 0	
1 Cutting		0 8 0	
			12 0 6
Second crop.—The same expenses, less cost of manure, &c.			6 14 0
Third crop.—Same as last.			6 14 0
Fourth crop.—Same as last.			6 14 0
			32 10 6

Thus, four crops, each yielding 6,200 pounds, gives a total of 24,800 pounds of green fodder, at a cost of Rupees 32-10-6, *making the cost of one ton* Rupees 2-15-1.

A crop of gram may be obtained before the regular cold season crop is sown; thus, if sown in the early part of August, it will be ready for cutting in the first week of October, or it may be grown after the removal of the regular crop. Last season we had two crops of gram-fodder, and one crop of maize, off one piece of land. The gram was sown in August, and reaped in October; the maize was sown in October, and harvested in January; the second crop of gram was sown in January, and was ready for cutting in April.

The following experiments were made to ascertain the feeding value of gram-fodder:—

(*a*) On the 2nd of February two bullocks were put up to feed; one was fed on grass, and the other on gram-fodder; each animal

received besides 2 lbs. of maize, 2 lbs. of cake, and 1 lb. of toor daily. The animals were weighed at the end of every ten days; the following are the results:—

Date of weighings.	The bullock fed on grass.	The bullock fed on gram-fodder.
	Pounds.	Pounds.
February 2nd	364	384
Do. 12th	408	374
Do. 22nd..	415	375
March 4th	421	389
Do. 14th	431	396
Do. 24th	430	403

The animal fed on grass increased 46 pounds in weight, and that fed on gram-fodder increased 43 pounds. The former gave an increase of 11·97 per cent.; while the latter gave an increase amounting 11·94 per cent. *Practically the results were the same.*

(*b.*) At the same time two pens of sheep, each containing five wethers, were put up to feed. One lot was fed on grass, and the other lot on gram-fodder; besides this, each lot received daily 5 lbs of maize, 5 lbs. of bran, and 5 lbs. of cake; at the end of every ten days each lot was weighed; the following are the results:—

Date of weighings.	Five sheep fed on grass.	Five sheep fed on gram-fodder.
	Pounds.	Pounds.
February 2nd	230	200
Do. 12th	232	201
Do. 22nd	225	196
March 4th	239	207
Do. 14th	242	224
Do. 24th	242	229

The lot fed on grass only increased 19 pounds in weight, whilst the lot fed on gram-fodder increased 29 pounds. The grass was the ordinary hariyali grass, such as is collected by grass-cutters for horses. At the usual rate paid to grass-cutters, this grass costs 10 *rupees per ton*. The gram-fodder, as I have already stated, *only costs 3 rupees per ton*.

Gram-fodder may be made into hay; when well made, the hay has a pleasant aromatic smell. It is readily eaten by horses. I have had no opportunity of experimenting with it in feeding horses; but several gentlemen who have tried it on my recommendation speak very favourably of it. One ton of the fodder makes about five hundred-weight of hay. One ton of the hay will, therefore, cost about 15 rupees.

(*Summary.*)

1. Gram is easily grown; it will grow on the poorest soils.
2. When well manured and properly cultivated, it answers all the purposes that vetches do in the practice of the British Farmer.
3. A piece of fresh soil produced in two months, a crop averaging 4. tons 15 cwts. 8 lbs., per acre.
4. Five crops *grown without any rain-fall*, gave an average yield of 6,200 pounds per acre.
5. The seed may be sown at the rate of 35 lbs. per acre, in lines, 20 inches apart, and about two inches deep in the soil.
6. The crop should be cut immediately the flower appears.
7. When cut, before maturing its seeds, gram improves rather than impoverishes the soil.
8. Four crops may be grown during one season, producing 10 *tons of fodder at cost of 2 rupees 15 annas and 1 pie per ton.*
9. A crop of gram-fodder may be obtained either just before, or immediately after the cold weather crop.
10. Gram-fodder is as nutritious as hariyali grass, and cost only 3 *rupees a ton*; whilst the grass costs 10 *rupees*.
11. Gram-fodder may be made into hay. One ton makes about five cwts., and the cost per ton is about 15 rupees.

ANNUAL REPORT OF THE MANAGEMENT OF THE GOVERNMENT FARM ESTATE, FOR THE YEAR ENDING 31ST MARCH 1871.

THIS Estate consists of the properties formerly known as Roshanbaugh Estate and Homes' Garden, and is situated near the Sydapet Village. A portion of the estate situated on the north side of the Cutcherry compound, which is quite isolated from the remainder of the property, has been let to a tenant for a term of five years, at an annual rent of Rupees 160, under stringent conditions as to cultivation, &c. About 130 acres on the south side of the ravine constitutes the "Experimental Farm," and about 120 acres on the north side is occupied by the "Model Farm." The remainder of the estate is occupied by the Roshanbaugh village, the Wudder village, the Sydapet school, and the Commissariat slaughter-house grounds.

It is usual in preparing these reports for the Reporter to confine himself to a mere narration of the different works done, and the general results obtained during the year under review. I intend, in the present instance, to depart a little from the usual course. Our experience has now, I think, arrived at a stage which will justify us in forming some conclusions on the general results of our labours. We require something more than a mere record of our doings; our work is becoming educational. We need to place on record much fuller details than has hitherto been thought necessary. I believe that to a very considerable extent, the small progress made in this country towards the establishment of a more rational system of agriculture, is chiefly to be attributed to the almost entire absence of records, showing what has been done by those who have made agricultural reform their special study. We, of the present day, are doubtless unearthing facts which were discovered years ago, and possibly going over ground which was long ago proved to be barren in beneficial results.

Season.

The year commenced very unfavourably. There was no rain during either April or May, the heat during these months was intense, and stock suffered greatly; the land was parched and so hard that the plough could scarcely penetrate it; indeed, it was quite as hard as it usually is in cold countries after a severe frost. The weather was much more favourable in June; the heavy showers on the 11th and 12th enabled us to commence ploughing again. We took advantage of this opportunity to sow a few acres of cumboo and gingelly. The showers in July and August were very favourable for growing crops, but caused a great deal of extra work on the fallows, in keeping down weeds; indeed, the land was cleaned with great difficulty; the more it was cultivated and worked, the faster the weeds grew. The rain-fall of these two months was 16 inches, nearly 7·08 inches more than the average for the same period during the last ten years. A considerable area of crop was put down early in September; the dry weather experienced during the latter half of the month was very severe on the young seedlings. October was an excessively wet month; the total rain-fall, 16·63 inches, was 8·19 inches above the average of this month during the last ten years. On the 18th and 19th, upwards of 10 inches fell. Much injury was done to the crops which had been sown during the previous month. Dry crops would have been much better with one fourth of the fall; however, wet crops luxuriated in the deluge, and tanks filled rapidly. The weather during the early part of November was favourable for getting in the regular cold weather crops. All dry crops suffered in December, the total rain fall of these two months being only 6·64 inches, 8·20 inches below the average fall for the same period during the last ten years. Crops sown in November, after the heavy rains of October, started well, and grew vigorously for the first four or five weeks, when the dry weather began to be felt. Their after-growth was slow; the plants were dwarfed, and the grain, in most instances, was very imperfect. A comparison between the rain-fall of these two months—the most important months in the year to the dry land cultivator of this district—and of the corresponding months of last year gives the following results:—

	1869.		1870.	
	Rain fall	Wet days.	Rain fall.	Wet days.
November	8·35	21	5·44	12
December	5·24	9	1·20	3
Total.	13·59	29	6·64	15

The weather experienced during the remainder of the year needs no special comment. Though the rain-fall of the year is the heaviest we have had during the last ten years, I have no hesitation in recording my opinion, that the past season has been a very indifferent one for the dry land cultivator, though a very good one for the cultivator of wet lands.

The monthly registrations are as follows:—

	Inches		Inches.
April	.	November	5·44
May	.	December	1·20
June ..	5·32	January	1·20
July . . .	8·48	February	·68
August ..	7·52	March	·70
September	6·30		
October	16·63	Total Inches ..	57·07

The daily registrations are recorded in the Appendix.

Buildings and Permanent Improvement.

The granary referred to in my last annual report has been completed. It is a good and spacious building, and has been very useful during the past twelve months. The abundant space at command enables us to make purchases of cake or other cattle food, when the market rates are sufficiently low. The upper floor affords ample accommodation for seeds sent for storage. The packing room is a great convenience; in it all seeds are cleaned and packed for distribution.

The results attending the loose box system introduced last year having been so very satisfactory, it was determined to convert all the cattle byres into loose boxes; this has been done

with the best results. Under the old system the cattle were fastened by a chain to the front of the stall. They had very little space, and could not lounge comfortably. The byre has been divided by palmyra poles fixed in brick and chunam pillars into spaces each containing about seventy square feet. It now affords space for four or five additional cattle, and every animal has plenty of room. The flooring of the old byre was removed and the ground was sunk about a couple of feet. Into these boxes, the cattle are turned loose at the middle and end of the day. A sufficiency of bedding is always allowed, and the manure accumulates until it rises to the level of the surrounding ground; thus, we save the expense of daily removal, and preserve the fertilizing qualities of the manure.

The fences have been cut over and brought into a better shape, and a considerable quantity of fresh seed put down in blanks and other deficient parts of the hedges. These corkapilly hedges are difficult to raise on our sandy soils, but when once the roots get down into the sub-soil out of the reach of the sun's rays they are constantly green, and are not only useful, but ornamental fences. Fifty grafted mango trees, fifty cocoanut trees, and about fifty tamarind and other trees were planted last season on the Experimental Farm. A nursery has been started; in it it is intended to raise young trees for planting over the estate. The fifty acres of land which we resumed possession of last year has all been cleared and brought under cultivation, and a considerable area of the low land near the river side has been laid out for irrigation; a portion of this is watered by gravitation, and of the remainder, none is more than two feet above water-level. Though in the wet season this land will constantly be subjected to flooding, still, during at least nine months in the year, there is no danger of this. This wet land will afford an abundance of green food in the dry season, when the high land is parched and bare. A considerable amount of work was done last year in levelling the surfaces of the different fields, and in cutting open drains to carry off the water which falls during heavy rains.

The portion of the estate situated on the northern side of the ravine was cleared, fenced, and brought under cultivation during the past year, and about 120 acres was laid out and set apart for the purposes of a Model Farm. This land was formerly in the hands of tenants. It returned during the last four years an average annual revenue, amounting to 535 rupees. It was necessary, in order that the land should be thoroughly reclaimed and put into a good cultivable condition, that a large number of indifferent mango and guava trees should be cut down. These were chiefly old trees which would not continue to bear much longer, though for a season or two they would be worth 150 rupees per annum. Deducting this sum from the average annual income from the land, there remains a balance of 385 rupees, and this sum will be the yearly rent to be recovered from the Model Farm. The timber and jungle clearings realized 2,721 rupees, this was carried to the credit of the estate, and again laid out on permanent improvements on the land, the Model Farm having to pay seven and a half per cent. per annum on the outlay. The gross annual income from this land under the new arrangement will, therefore, be nearly eight per cent. above the average collection of the past four years.

These permanent improvements, or landlord's improvements as they are elsewhere called, are as follows:—A complete set of farm buildings, consisting of overseer's residence; three large sheds for cattle, containing thirty-one loose boxes; a cart and implement shed; a straw house; a grain and tool store; two poultry houses; pig styes, &c., the total cost of which was rupees 1,757-7 8. Fencing the land cost rupees 142-11-3. Clearing and levelling cost rupees 1,204-15 5. The roads cost rupees 408 1-10, and certain small items, not included in the foregoing, made the total expenditure rupees 3,522 11-2. A sheep shed is being erected, and a well to supply the buildings with water is still needed; but, with these items added, I do not think that the actual outlay on permanent improvements on the Model Farm will reach 3,800 rupees.

A building containing blacksmith and carpenter's workshops has been erected, in which all kinds of agricultural implements and tools can be made or repaired.

A village school for the children of the work-people was commenced during the year. It owes its origin and support, during the first few months of its existence, to the liberality of a member of committee. It is now supported from farm funds. It is popular amongst the villagers, and is fairly attended by the children, while many of the men have expressed a wish to be allowed to avail themselves of the school teacher's services. There is, however, scarcely a suitable man. There are 150 families resident in the village, and, with a properly qualified teacher—that is; one who understands the people—much good might be done amongst them.

THE EXPERIMENTAL FARM.

This Farm is situated on the south side of the ravine. It is bounded on the west by the Mount road, and on the south and east by the river Adyar. It contains about 130 acres. The soil is, as I have often had occasion to remark, one of the poorest under cultivation. With the exception of four or five acres near the river, the farm is entirely under dry cultivation. About a dozen acres can be watered by the wells; but the average lift is nearly twenty feet. This Farm is devoted exclusively to experimental cultivation, and is purely educational:—

Cattle.

Nellore Bull	1
Buffaloe Bulls	3
Working Cattle	27
Feeding Cattle	21
	52

The large increase in the area of this farm has necessitated the employment of four or five additional pairs of draught cattle. They were all fully employed throughout the year. In the dry season, when very little farm work could be done, they were employed on estate improvements. Their food consisted of maize and cholum straw, either green or dry, according to the season, with horse gram and ground-nut cake.

To ascertain the relative feeding values of ground-nut cake and horse gram, as foods for working cattle, the following experiment was made:—A lot of eight draught cattle of average size, and similarly worked, was equally divided. One lot was fed daily on 12 lbs. of ground-nut cake, and the other lot on 12 lbs. of horse gram; the following are the results:—

On Ground-nut cake.

	lbs.
First weighing	2,737
Last weighing, twenty-seven days afterwards	2,733

On Horse Gram.

First weighing	3,007
Last weighing, twenty-seven days afterwards	3,070

The ground-nut cake was steeped before being given to the animals, and the gram was boiled in the usual manner. Besides these foods, the cattle had a full allowance of straw.

The cost of the cake used was about 90 lbs. per rupee, and of the gram 80 lbs. per rupee.

The experiment proves that working cattle will keep in better condition when fed on cake *alone*, than they will when fed exclusively on gram.

Ground-nut cake can generally be purchased here at a lower price than gram; and the manure made by the consumption of a ton of cake is much more valuable than that made from the consumption of a ton of gram.

I have long thought that to boil gram for our live stock is a useless piece of extravagance. The careful feeder who is acquainted with the extraordinary manner in which gram will increase in volume, when abundantly supplied with moisture, and therefore knows the danger of administering it to animals in its natural state, endeavours by boiling to expand the gram to its fullest limits before it enters the stomach of his stock. His primary object is thus to effect a mechanical and not a chemical alteration in the food. True, there will be some slight chemical changes in effecting this, still they are only trifling, and can give it no additional value. Finding by careful experiment that a volume of gram increased in nearly the same ratio, whether boiled or steeped, I tried the effect of steeped gram on a riding horse which was much out of condition. I gave him daily 4 lbs. of gram (a little over a Madras measure) and 2 lbs. of ground-nut cake. Both the gram and cake were thoroughly soaked in cold water. The monthly cost of feeding was as follows:—

	Rs	A.	P.
Grass-cutter's pay	3	0	0
6½ lbs. of ground-nut cake, at 90 lbs. per rupee ..	0	10	8
120 lbs. of horse gram, at 80 lbs. per rupee ..	1	8	0
Total..	5	2	8

This allowance is too small for a horse that has to run in harness fifteen or eighteen miles a day; still, for a large number of the horses of this district, which are only used for two or three hours in the morning under the saddle, it is enough.

The horse has now been fed in this manner for three months, and has made most satisfactory progress. Though this horse never refused the steeped gram but ate it as well as he would eat boiled gram, still I should mention that another horse, not only refused the steeped gram, but preferred to starve rather than eat it. It is, however, well to remember that the horse-keeper, in the substitution of steeping for boiling, will experience a diminution in his perquisites, and therefore will do little to facilitate the change.

I had no means of testing the matter further on horses; but the experiment is so interesting, and promises such beneficial results, that I have no doubt but that those who have greater opportunities will bring the matter to an issue.

In cattle feeding, the results of my experiments with steeped gram have been most successful. For some time the cattle on these farms were all fed on steeped gram. Amongst many others, the following experiments were made to test the relative feeding values of boiled and steeped gram. A lot of sixteen draught cattle, similarly worked, was equally divided. One lot

was fed daily on 12 lbs. of *boiled* gram and 12 lbs. of ground-nut cake, while the other lot received daily 12 lbs. of steeped gram and 12 lbs. of ground-nut cake.

The animals on the boiled gram—

	lbs.
Weighed at the commencement of the experiment ..	6,339
Twenty-seven days afterwards they weighed ..	6,576
Showing an increase of	237

The animals on the steeped gram—

Weighed at the commencement of the experiment ...	6,310
Twenty-seven days afterwards they weighed	6,576
Showing an increase of	266

I am so satisfied with the general results of these experiments that I will in future abandon altogether the boiling system, and adopt the cold water method.

It is difficult to state the *exact number* of hours that it is necessary to steep gram before it is fit for consumption; so much depends upon the temperature of the air: if the weather is very hot, a shorter time is necessary than during cold weather. But each experimenter can decide this for himself; it is only necessary, at a known time, to put, say, an ounce of raw gram into a tumbler of cold water, and to note at what time it ceases to expand. Under ordinary circumstances, fifteen hours is sufficient.

The following may be interesting:—Fifty lbs. (16½ Madras measures) of mixed gram, old and new, was put into 90 lbs. (25 measures) of cold water. It was steeped for seventeen hours. After being allowed to drip, the gram was found to weigh 95½ lbs., while it measured 38 Madras measures; 46½ lbs. of water remained in the vat, so that had we used only half the quantity of water, or 45 lbs., it would have been enough. The residue water contained 1 lb. 9½ oz. of extractive matter, chiefly gum and mucilage, which the water had extracted from the gram.

The results of the foregoing experiment may be summed up as follows:—One measure of gram steeped in one measure of water will, after soaking for fifteen hours, yield a volume equal to nearly 2½ measures. A little less, if the gram is old; and a little more, if it is new.

Fifty lbs. (16½ measures) of the same gram was then put into a boiler along with 90 lbs. (25 measures) of water. After boiling for three and a half hours it was removed, and after being allowed to drip, was measured, when it yielded 38½ Madras measures, only half a measure more than was obtained by the cold water process. The total weight was 100½ lbs. Seventeen and a half lbs. (4½ measures) of water remained in the boiler, this contained 2 lbs. 5 oz. of colouring and extractive matters, chiefly gum and mucilage. The firewood consumed weighed 32 lbs.

All the working and feeding cattle are now stabled in loose boxes. The change has been most beneficial. The animals have enjoyed perfect health, and the feet of the working cattle are as sound as they were under the old system; indeed, I think they are better now than formerly; the horn of the hoof is less flinty, and more elastic.

A number of cattle have been fattened, with results very similar to those detailed in the last report.

Sheep.

Rams	10
Ewes	83
Wethers	32
Gimmers	13
Lambs	54
	186

We have still a number of indifferent sheep in our flock. These we are weeding out as they become ready for the butcher. The flock is, however, greatly improved; the sheep are becoming more uniform in shape and in size. I hope ultimately, by continuing on in the present course, to produce a flock possessing all the good qualities of the best of our sheep. Our success has been, so far, most satisfactory. The lambs of this season are the best and the most uniform lot we have had since I knew the flock.

I adopted the plan proposed in the last report, and put the ram to the ewes a month later than last year. The result has been all that I could wish; instead of eight or ten per cent. of our lambs dying, we have not lost two per cent.

This season both ewes and lambs were kept in the sheds until the lambs were five or six weeks old. I found, in former season, that the very young lambs suffered greatly from the heat of the sun.

By carefully selecting the rams, and by breeding only from ewes that possess certain qualities, we are gradually producing a new variety of sheep.

The rams we are now distributing are valued greatly by native flock-masters. In confirmation of this, I may record, amongst other instances, that we recently had an application from the Coimbatore district, where we had just sent five rams, for a dozen of our best rams, for which certain native flock-masters would willingly pay the full price and the carriage to Coimbatore. We have also had applications from Ceylon and from different parts of India. Though this is not a sheep district, I have had several applications for rams for use in this locality. I have had most reluctantly to refuse several of these applications, as our flock is so small, and as it must be some time yet before our improved breed will be regularly established. It is certainly very desirable to issue rams of the improved breed as early as possible, but I think that it is still more desirable to stamp the flock with some fixed characteristic before sending out any number of sheep. It must be remembered that this variety is only the result of careful selection, and that it will deteriorate almost as rapidly as it has been improved, if left to injudicious management. This is now only the third season since this system of selection was commenced.

As the breed is quite a distinct variety, being entirely the result of artificial circumstances, it should have a name. I propose, therefore, in all future communications or reports, to refer to this breed as the "Sylapet Sheep."

Amongst other characteristics of this breed, it comes earlier to maturity; it gives a larger percentage of flesh for the food it consumes; and has a much better constitution than any native breed I am acquainted with. They have a fair covering of wool; but it is, as must be expected in these scorching plains, not of first-rate quality. When introduced to colder districts, I have no doubt but that they will be good wool-producers.

A full-sized ram averages about 115 pounds "live weight." The following are the weights of three of our "Sylapet rams":—

123	Pounds.
108	do
101	do

The last of these rams is under two years old.

The ewes are smaller; when full grown and in fair condition, they will average from seventy-five to eighty lbs. per head.

We are now grazing our ewes and lambs over the second crop of cholum and on the horse gram. They are getting on very satisfactorily. I have not yet been able to provide myself with sheep nets; but hope before another season, to be fully supplied with these, when we will adopt a regular light land system of management and grow gram, cholum, and cumboo, for consumption on the land, in preparation for maize, cotton, and other valuable crops, which the scarcity of manure prevents us from growing to any extent at present.

Pigs.

Boars	2
Sows	8
Young Pigs	19
	29

Pigs are useful as a part of the live stock of a farm; but they are not a very remunerative stock, excepting under special circumstances. The past has been a fair average year, yet our sales during the twelve months only realized rupees 271-6-8, while the cost of feeding and attendance amounted to rupees 185, leaving a balance of Rupees 86-6-8. To this must be added the value of the manure, probably another 15 rupees, making a gross return of rupees 101-6-8. But, as the present value of the stock is only rupees 230, while it was valued at rupees 307 at the commencement of the year, the profit is only rupees 34-6-8, about six per cent. on capital invested on buildings and stock.

Poultry.

The Brama Dorking breed of fowls introduced from Australia two years ago still maintain their valuable qualities. They are now largely distributed over the presidency, and generally with the best results.

Manure.

The cattle boxes have yielded a considerable quantity of excellent manure. This manure is a great deal more valuable than anything of the sort I have yet met with in this country. It contains all the liquid and solid excrements of the animals.

We have altogether abolished the cattle *byres* and the open manure yard.

The time required by the boxes in becoming full, varies according to the season. During the wet season, when we use more bedding, and give our stock more green food, they fill more rapidly than during the dry season, when the evaporation is great, and green food scarce. Probably, on the average, twelve weeks would suffice. When full, each box contains a volume of manure equal to about five cart-loads; the weight varies with the season.

Our fifty loose boxes on this farm, will, during an average year, yield us 1,000 cart-loads at least of really good manure. Under no other system do I believe it possible to obtain a result anything like this.

Besides fold-yard manure we have used a considerable quantity of tank mud, brickyard dust, the refuse of the Commissariat slaughter-houses, bazaar ashes, &c. The last-mentioned manure, when it consists, as it does sometimes, entirely of the ashes of cow-dung, is very valuable. We have also used a considerable quantity of carbonate and sulphate of

lime, with fair success. The carbonate of lime used was the ordinary shell chunam of the district. It cost about 15 rupees per ton, a price much too high for ordinary agricultural use, but, as will be seen on a reference to the sorghum experiment, the expenditure incurred for lime was repaid with a large balance over.

Inquiries have been instituted for lime, suitable for farm use. Samples have been received from Cuddapah, Poontoor, and from the village of Vellicherry, near Guindy Park. Dr. King, the Chemical Examiner, kindly made the following analysis of these limestones :—

Vellicherry Limestone.

	Per Cent.
Carbonate of lime	70·0
Moisture	1·2
Clay, sand, and other materials insoluble in Hydrochloric acid..	28·8
	100·0

Poontoor Limestone.

Carbonate of lime	75·4
Moisture	2·0
Clay, sand, and other materials insoluble in Hydrochloric acid ..	22·6
	100·0

Cuddapah Limestone.

Carbonate of lime	76·91
Moisture	2·85
Clay, sand, and other materials insoluble in Hydrochloric acid..	20·25
	100·00

The first limestone can be delivered at the farm at about 2 rupees per ton; but it is in the raw state, and needs to be calcined before it is applied to the soil; this is the difficulty. Coals at 30 rupees per ton are far too expensive, and the native plan of burning it with wood and cow-dung fuel is very little cheaper. In fact, lime dealers ask as much for calcined lime-stone as they demand for calcined shells. It is perfectly true that lime may be applied to the soil in a powdered state without being calcined, with the probability of some little good being done, but the action of unburnt lime is so very unimportant that it will, in very few instances, repay the cost of its application. Until coal becomes cheaper, there is little probability of much lime being used in India agriculture and seeing that lime used on an impoverished soil, without any other manure, only hastens the final exhaustion, it is perhaps as well.

Sulphate of lime, the refuse of the soda water manufactory, has also been used with considerable success. This can be delivered at the farm at about 1 rupee per load.

Natural sulphate of lime has also been tried, but it has to be brought a considerable distance, and costs nearly 20 rupees a ton at the farm.

I have this year used saltpetre (nitrate of potash) with *great* success. It will be noticed that in the experiment with sorghum saccharatum, an expenditure of 18 rupees per acre on saltpetre doubled the crop, and left, after paying expenses, a profit amounting to nearly 30 rupees per acre.

The saltpetre used in this instance was bought in Madras at the rate of 10 lbs. per rupee. However, it is not necessary to purchase the finest sorts; suitable samples for top-dressing can be purchased at a much lower price. The late Collector of Salem kindly forwarded me a sample of crude saltpetre from his district, which could be procured there at 60 rupees a ton; the following is the analysis of this sample :—

Moisture	7·90
Sand	4·31
Chlorides	5·40
Pure Nitre (Nitrate of potash)	82·40
	100·00

This is a very economical manure in districts where it can be had at anything like this price. The heavy expense of conveying to Madras, which includes a most unreasonable railway charge of Rupees 65 per ton, makes it rather a costly article for the ryots of this district; still, as I have already proved, it will pay to use it in top-dressings, in quantities of 100 or 120 lbs. per acre on certain crops.

Irrigation.

As I have elsewhere stated, we have only four or five acres of land on this farm that can be watered by gravitation. The great bulk of our land is situated at a level at least twenty feet above the water-mark.

Though several of our water lifts do their work in a very satisfactory manner, we have none that can water an acre of land at he high level at a less cost than 1 rupee.

Under ordinary circumstances, watering is equal to a rain-fall of two inches, or about 45,000 gallons. A crop of five months paddy grown during the cold season in this district, would, allowing for the usual rain-fall, require at least thirty waterings to bring it to maturity; a little less, or a little more, as the soil is porous or retentive.

The cost of watering would, therefore, amount to 30 rupees per acre; to this must be added the cost of cultivation, seed, manure, rent, &c., probably together amounting to 15 rupees. A crop of paddy will therefore cost 45 rupees. A fair crop in this district will yield 600 measures of grain and one ton of straw per acre. At present rates the grain would be worth 20 rupees, and the straw 10 rupees. Under these circumstances, a crop of paddy could only be produced at a loss of 15 rupees per acre.

While, therefore, we cannot on these *high levels* grow paddy *at a profit*, it does not follow that it is a mistake to attempt to raise water to such a height for agricultural purposes. There are crops that will pay for an *occasional* watering, and there are times when the stock-owner is glad to give any price for green food. Under such circumstances it is good policy to raise water even as high as twenty feet. Still, I believe, that as a rule, it will be found much the safest and most profitable plan on these high levels to sow only such crops as seasonable weather will suffice to bring to maturity, and to avoid, as much as possible, raising water to any height exceeding ten feet.

We have abandoned the "Steam Water Lift"; it was far too costly; with this exception all the water lifts described in the last report are in regular use, whenever their services are really required.

I have long thought it a great mistake to raise water to a height of fifteen or twenty feet, and then to pass it two or three hundred yards along earthen channels on embankments; there is such an enormous waste of water from soakage, a matter of *considerable* moment, when it is remembered that the water required for irrigating an acre of paddy costs, each time, one anna at the least for every foot it is raised above water-level. I think when it is necessary to send water to any reasonable distance, it is a better plan to make a channel, instead of raising an embankment, and to allow the water to flow by gravitation to the place required. The loss from soakage would thus make no difference to the cultivator, and the water could be raised *just where* it is required.

When the level is not more than ten or twelve feet above the water mark, and other circumstances permit, a system of main channels, with picottahs, at the points where the water is needed, would, I think, be a much better arrangement than our present plan.

We have a surface of fifteen or twenty acres suitable for channel irrigation; the land has been surveyed, and will, during the present year, be laid out for irrigation in the manner described.

Rotations of Crops.

Undoubtedly many benefits result from the adoption of a rotation in cropping, still these advantages may be purchased at *too high* a cost. In a well cultivated district, which is not subjected to any great atmospheric changes, but where the seasons recur with clock-work regularity, and with perfect uniformity, it may be desirable to introduce a regular system of rotation. A properly arranged rotation of crops not only enables the farmer to make the best use of the plant food in his soil, but tends to conserve those fertilizing ingredients. One tribe of plants thrive and luxuriate upon food which may not only be useless, but even noxious to another tribe. One order of plants delights in lime, another in phosphoric acid, a third in potash, and so on. Some plants have tap roots, some fibrous roots. The roots of some plants feed on the surface of the land, while the roots of others derive their sustenance from the lower stratum. Some plants are consumed by stock on the farm, and the excrements of the animals fed on them are again returned to the soil; while others are removed from the farm, and none of the fertilizing matters they contain are returned to the soil. Some plants have narrow leaves, and have an upright habit of growth and encourage the growth of weeds; while others have broad leaves and put out lateral branches, which shade the ground and check the growth of weeds. If a certain crop is cultivated year after year on the same piece of ground, it will ultimately remove such a quantity of the particular plant food it delights in, as to render the raising of a remunerative crop of this particular plant a matter of great difficulty. Granting, that by careful manuring, the elements of plant food taken up by a certain crop can be regularly returned to the soil, there are still many difficulties to contend against. Thus, it has been found that certain insects prey on particular crops, and that if these crops are repeated too frequently, they increase to such an extent as to interfere very seriously with the profitable culture of these particular crops. Again, some plants—many of the leguminous for example—have large fleshy roots, in which they have stored up a large amount of nitrogenous matter, which they have elaborated from the amoniacal matter their leaves have taken from the air; these roots, when left in the soil, decay, and afford a large quantity of excellent food for the following crop. This is well-known in England, where a good clover crop— and therefore plenty of fleshy roots—is invariably followed by a good crop of wheat, and I have noticed here that a cereal crop after a gram crop is generally a good one. Though a large crop of grain removes a good deal of lime from the soil, it is nevertheless considered by ryots as a restorative crop, and the reason I have just given explains

this apparent paradox. This farm, being devoted exclusively to experimental cultivation, I have adopted no rotation of crops; it is useless to attempt to fix a rotation, until we have discovered all the qualities and peculiarities of the different crops we are called upon to grow. We might afterwards devote a portion of the farm to experimental rotations, but at present we have not the space to lay aside for the purpose. On the "Model Farm," however, as we get the land under regular cultivation, I intend to adopt a rotation in cropping, still this cannot be done for some time. The uncertainty of our spring cropping in this locality, owing to the irregularity of the rainfall during the prevalence of the south-west monsoon, will always be a hindrance to the establishment of a fixed rotation, as the possibility or otherwise of growing a spring crop will always affect the rotation. A failure in the crop of turnips or clover always upsets a rotation in England; but the case must be much worse *here*, where the weather may be such as altogether to prevent the sowing of one of the crops in the rotation. As far as my experience in this country enables me to judge, I would suggest the following dry land rotation, as one worth trying on the better kinds of sandy loams in districts circumstanced like this:—

Autumn Crop.—Maize: well manured; followed by *horse gram* consumed on the land by sheep.

Spring Crop.—Gingelly.

Autumn Crop.—Cotton: manured with well rotted fold-yard manure, with about 1 cwt. per acre of bone dust.

Spring Crop.—Cumboo: as a fodder crop; consumed while green on the land by sheep and cattle.

Autumn Crop.—Yellow Cholum: well manured with fold-yard manure; first crop seeded, second crop eaten on the land by cattle and sheep.

Spring Crop.—Cumboo.

Autumn Crop.—Green Gram: well manured; followed by *Tenney.*

Spring Crop.—Indigo: ploughed in.

Autumn Crop.—Maize: as before.

This is a four years' rotation, but instead of only including four crops as it would in England, it includes ten crops. Of course many modifications of this rotation could be adopted; indeed, it is impossible to suggest a rotation that will suit all. In this rotation we have seven crops, the produce of which can be sold; the other three are restorative crops, being consumed on the land. This rotation provides for an abundant supply of fodder at all seasons of the year,—also for the frequent change of crops,—and it is arranged for the manure to be applied to the autumn crop during the heavier monsoon, as when applied to the spring crop, with a light rain-fall, it either forces the plant too much at first, rendering it unable to withstand the effects of a drought, or, if the weather be *very dry*, it remains undecomposed in the land, making the soil light and puffy, and adding greatly to the injurious effects of the drought. A "Hundred Acre Farm" under this rotation, will annually have twenty-five acres under cotton, a much larger area than I think it would be safe to grow under any present arrangement; while during the year, a surface equal to 150 acres will be available for growing crops for human consumption.—*To be continued.*

We, *Madras Times*, hear that the question of agricultural improvement is now the principal question engaging the attention of the Madras Government, and that it is likely to form the stock subject of discussion during their stay at Ootacamund. It is proposed to establish, in different parts of the Presidency, experimental farms, as branches of the Government experimental farm at Madras, the whole to be under the general direction of Mr. Robertson, now at Sydapet. The objects of these farms will be to ascertain the proper rotation of crops in the various districts, and to introduce new crops suitable to the climate. There can be no doubt that the Government possess, in Mr. Robertson, a man admirably qualified to direct an undertaking of this kind.

COTTON CULTIVATION IN THE MADRAS PRESIDENCY.

Certain suggestions of the Cotton Commissioner for following up the experiments made, having been communicated to the Board of Revenue for report, the following are the conclusions arrived at by the Board, and in which the Governor in Council agrees:—

The Board do not think that the evidence before them justifies the Cotton Commissioner's summary conclusion that the native cultivators of this Presidency, when cotton seed is distributed to them, make the experiment fail of its purpose.

The frequent failures that have occurred can be accounted for without imputing ill-faith, as may be gathered from the following observations on the subject by a scientific farmer of great experience, Mr. Robertson, the Superintendent of the Government Farm at Sydapet:—

'The discouraging observations of Government officers, which are frequently met with in these replies, regarding the results of experiments made by native cultivators, are not always fair, and generally far too sweeping. If the writers of these comments had had a few years' experience in the management of Irish properties, or even if they were personally acquainted with our English farmers, they would not write so severely. *All* tenant farmers are suspicious when anyone interferes in their concerns; and, in this respect, I fear, that we, farmers, form no exception to the general rule. I have known Irish landlords go to great expense, and put themselves to a great deal of trouble to procure for their tenants unadulterated manures, seeds, and feeding stuffs, at wholesale rates; but their good intentions were seldom appreciated by their tenants. Many had the manures, &c., thrown back on their hands and suffered severe losses. Tenants were suspicious; and though one or two, whose rents were in arrears, or had other reasons for wishing to keep in the good graces of the landlord, or his agent, might take small supplies, still the great bulk of the tenantry would not purchase. Some excused themselves on the plea that they could not afford to purchase the article, or that they had been offered similar goods at lower price; while others would assert that their cattle did not do well on the feeding stuffs, or that the manures did not suit their land. But the truth was they could not understand the motive of their landlords in interfering in what many *imagined* only concerned themselves. Again, I am acquainted with Irish properties, on which agriculturists were appointed to teach the tenants a better system of cultivation; yet their services were seldom utilised. The tenants looked on them as the landlord's spies sent to ascertain the productive powers of the soil. Many landlords again purchased travelling threshing-machines for the use of their tenantry, but had the mortification of seeing them standing for months unemployed. Some bought valuable bulls and allowed them to be used by their tenants, free of all cost, yet few availed themselves of this liberality. Further, when our agricultural societies first commenced, few farmers would join, and fewer still exhibit at the shows. They looked upon those exhibitions and societies as so many expedients of the landlord to find grounds for increasing the rent. And at the present day, even agricultural statistics cannot be collected with complete accuracy in England, for the farmers of a few localities still positively refuse to fill up the statistical forms on the plea that they may thereby be giving their landlords too much information.

If agricultural improvements make such slow progress even in Great Britain, what can we expect out here? We cannot hope to quiet the apprehensions of our ryots in a few years, and secure their confidence by a few casual and spasmodic efforts of the kind. The necessary confidence must be the work of time. I believe that in many instances, the ryot has done justly by the seed that was supplied to him, but the seed was frequently quite unsuited to the low *agricultural condition* and *practice* of the country. Again, in many instances, the seed had been issued at unsuitable seasons, or the ryots were not properly instructed as to the *details* of cultivation, and not unfrequently the seed was useless before it reached the ryot.

I have little faith in these traditions about wilful destruction of seed sent for experiment. I would attribute the frequent inaccuracies found in reports of experiments made by native cultivators, not to a desire to mislead, but to carelessness or ignorance on the part of the cultivator. *A field experiment* needs far more care and supervision than any cultivator, *who has his living to earn*, can possibly devote to the matter. The *ryot* seldom has any convenience for separating the produce of the experimental crop from the general produce of his land, has no means of measuring or weighing the produce accurately, nor probably has he any knowledge of the weights and measures in which his results are returned. These are only a few of the difficulties which the native experimenters must feel.'

The Board have already stated their reasons for believing in the uselessness of these experiments, and of similar random attempts to improve a stubborn agricultural system, which will yield to nothing less than organized scientific instructions, and even to that, but slowly.

For the same reasons it seems to them that it would be a simple waste of public money to establish a cotton garden under a new gardener. The influence of an isolated spot of cultivation like this would be infinitesimal, and it is well that it should be, since it seems that similar gardens have been established elsewhere, for farming superintended by a gardener is almost sure to fail. Gardeners know as little of agricultural implements, stock breeding and feeding, rotation of crops, and the like, as farmers do of grafting, forcing, pruning, and floriculture. If the experiment is tried at all, it should be as a model farm under a scientific farmer.

Desultory attempts at improving cotton have already been made in this Presidency on a greater scale than is possible now, and their complete failure is a lesson that should not be forgotten.

Doctor Wight, a botanist and gardener of the highest character, was for years employed in superintending cotton experiments, in distributing sea islands and New Orleans cotton seed imported at great cost from America, and experienced cotton planters were brought out of from America to work cotton farms and experiments. Reports were written, mer-

chants and English exporters were led to expect great things from the cotton commission, but utter failure was the result of these enormously costly and persistent exertions.

It has been and always will be hopeless to attempt improvements in cotton cultivation, until they form part of a general organized system for the gradual elevation of agriculture and the technical instruction of the agricultural classes. The Board have laid their views on this subject before Government, in their letter of the 23rd July 1870, No. 5013, on which, orders have not yet been passed. The production of cotton has become a question of such vast importance, that it calls for far more than garden and seed experiments; it demands that the whole agriculture of the country should be fostered and improved as it can only be by a system such as the Board have proposed.

The first member dissents from these proceedings, and has recorded a separate minute on the subject.

From Harry Rivett-Carnac, Esq., Cotton Commissioner; to the Secretary to the Chamber of Commerce, Bombay,

Dated Camp Oomraotee, 5th August 1871.

SIR,—As I am aware that the members of your Chamber will be anxious to receive, before the departure of the mail, further information regarding the prospects of the cotton crop in this part of India, I have this day addressed to you a telegram as follows:—

"Cotton prospects in Wurdah valley and East Berar favour-
"able; in West Berar about one inch of rain has fallen during
"the week, and prospects are better."

The following more detailed information may be of interest, and will, I hope, reach you before the departure of the mail of Tuesday next.

During the past week I have been at Nagpore and at Wurdah, and have had opportunities of ascertaining the news of many native landholders regarding the state of the cotton crop in the Wurdah valley. They all agreed in stating that notwithstanding the unusually heavy rain that has fallen, the cotton plants are doing very well, but that a break of fine weather to admit of the crop being weeded, and of the sowing of the jowaree (holcus sorghum) was much wanted. During the last two days the weather has been fine, and yesterday as I passed by railway through the Wurdah district, the cultivators were to be seen taking advantage of the fine morning and busily employed in cleaning their cotton fields with the "*dowrah*" or light grubber, in use in this part of India. The cotton plants both in Wurdah and in that portion of East Berar through which I passed, appeared to be very healthy and well forward.

At Oomraotee itself all are agreed in regarding the prospects of the crop in this part of Berar as favourable. It is as yet too early to frame an accurate estimate of the area sown with cotton this season, but the general impression is that the acreage is certainly not less than that of former years (para 5). Beyond passing through it in the train on my way to Nagpore, I have not yet visited West Berar. The following, however, is the latest information taken from the report of Mr. Dunlop, the Assistant Commissioner, dated Akola, 3rd instant:—

"The weather of late has been less unfavourable, but we have
"still to complain of a want of rain. Within the last few days
"rain has fallen in the district generally in a sufficient quan-
"tity to place the crops beyond immediate danger, but not to
"ensure them against the effects of subsequent dry weather,
"and we require fully two or three inches more to make them
"safe.

"The rain-fall at Allusna has been as follows:—

30th July	nil.
31st "	0·10
1st August	0·30
2nd "	0·67
	0·27

"Total up to date, 7·56 inches; and in Ballapore, during these
"four days, 0·36 inches fell. Sheagaum of late has had rather
"more rain than our other registering stations. The total fall
"in Julgaum is 6·70, and in Ballapore 5·73 inches.

"As a brief description of the present state of the crops,
"I would say that at present they are in quite a healthy condi-
"tion, but so backward that we are more than usually depen-
"dent on favourable weather, and the monsoon has hitherto been
"so irregular that we cannot look upon the success of the crop
"with much confidence.

"The cotton farm has fully benefitted by the late rain, and
"the crops on it are now making good progress. The principal
"sowing operations are completed, and the greater portion of
"the seed has already germinated."

At the close of my tour, that is to say in the course of another fortnight or three weeks, I shall hope to be able to supply you with further information regarding crop prospects, and the area sown with cotton in these provinces.—I have the honour to be, Sir, your most obedient servant,

(Signed) HARRY RIVETT-CARNAC,
Cotton Commissioner.

THE COTTON CROP IN THE CENTRAL PROVINCES AND THE BERARS.

From H. Rivett-Carnac, Esq., Cotton Commissioner; to the Secretary to the Chamber of Commerce, Bombay, Akola, August 15, 1871.

SIR,—In continuation of former correspondence, I have now the honour to report on the state of the weather and the prospects of the cotton crop in the Central Provinces and the Berars during the past week.

The accounts of the crop in the Wurdah valley and East Berar division still continue to be everything that could be desired. I have ridden through a good many fields in the country a few miles north of Oomraotee, which place I have just left, and the plants appeared to be in excellent case, and well forward; and I have heard not one single word of complaint of the season in my conversations with the native merchants and cultivators in this part of the country, a pretty sure sign, I think, that prospects are favourable.

The prospects in this part of the Berars (West Berar) are not so good. The complaint of want of rain is pretty general. In support of this, I append extract from Mr. Dunlop's Report, dated Sheagaum, August 9:—

"We are still suffering from want of rain. The weather continues to be cloudy, and daily partial showers fall, but the general cry in the district is for more rain. The young crops are fresh and green-looking, but are not making such rapid growth as they ought to, and there is an urgent need for two or three days' good heavy rain. If this does not come, the prospects of the season's crops will be bad. The last few days have been warmer than usual, which makes matters worse.

"Akote is the only part of the district from which I have received any favourable news. The tehseeldar of that talook, writing on the 7th instant, says: 'There has been a great fall of rain here, and the cotton and other crops are now in a thriving condition.' This is probably the case all along the base of the Sautpoora range, for I have observed that the clouds have almost invariably been attracted towards these hills, and the tehseeldar of Julgaum reports that from 1st to 7th instant, he registered 1·17 inches. The want of rain is most severely felt in the centre and southern portions of the district. In Sheagaum, during the week under report we have had a very meagre supply. In my report of the 3rd instant, I stated that the total rain-fall had reached 7·56 inches, and since then we have had only 0·12 cents, making a total of 7·68 inches. Such rain as this is dried up by an hour of sunshine, and has almost no effect upon the crops.

"The crops on the cotton farm are backward, and unless we get an abundant supply of rain soon, I fear the results will be very disappointing. So far the late sown plants are in a healthy state, but without more rain to set them up, they could not stand any prolonged dry weather."

The reports of the Deputy Commissioners of the Akola and Booldana districts, dated 8th and 7th instant respectively, are also appended. In the report of the Akola talook, it is stated, "the fall of rain during the week is so small that there is little or no improvement in the condition of the crops: but the weather being cool, they have not materially suffered, except the plants which are in some places destroyed by insects. On the whole, the agricultural prospects are unsatisfactory." With reference to the Akote talook, it is stated: "The rain-fall during the week has been beneficial, jowaree (millet) plants in some places six to eight inches high, and cotton plants four to five inches. In the Khamgaum talook it is reported that the crops of jowaree and cotton sown at the commencement of the monsoon towards the hilly country are in excellent condition, but the crops on black soil which were sown lately are but just coming up. In the Ballapore talook, the sowing of the cotton has been completed, but the seed on black soil in some places has not germinated." Rain much wanted in the Julgaum talook; it is reported that "the crops are in good condition."

The Deputy Commissioner of the Booldana district, writing on the 7th instant, says, with reference to the Chickloo talook: "The fall of rain has been very light and partial during the week. In some favourable places, the crops are fair. In the eastern and southern part of the talook they are withering. Owing to this, the ryots are much dispirited, and have taken their cattle to the ravines, leaving agricultural work." Of the Maiker talook, he says: "Sowing of khurreef has, since the fall of rain on the 31st July, been commenced. In the Lonar pergunnah the fall of rain is reported in some places to be plentiful." And of the Mulkapore talook it is reported: "There has been pretty good rain during the week, and the already sown crops have benefitted by it."

The following table will shew the rainfall throughout the district for the past month:—

Week ending 5th August.

Akola	[illegible]	inches.
Akote	[illegible]	"
Khamgaum	[illegible]	"
Ballapore	[illegible]	"
Julgaum	[illegible]	"

Week ending 6th August.

Chickloo	[illegible]	inches.
Maiker	[illegible]	"
Mulkapore	[illegible]	"

The reports from the Basim district are not favourable, but this is not one of the most important cotton-growing tracts.

The prospects of the season's crop may be briefly summarized thus as follows:—In the Wurdah valley, and in the eastern half of the Berars, prospects are very favourable. In the Akote country, and towards Jul-

[illegible] in the Akola district of West Berar, there has been sufficient [illegible] to ensure there is nothing to complain of. At Akola itself, Khamgaum, and in part of the Melkapur and Buldana districts, rain is much needed, and the present stage of the crop is critical. If rain falls again in the course of one or two days, all the crop in the only portions of the Berars regarding which any misgiving is felt, will not suffer materially, and this portion of the Berars represents rather less than one-quarter of the whole cotton field.—I have, &c.,

HARRY RIVETT-CARNAC,
Cotton Commissioner.

P.S.—The following information, dated 20th August, has just been received from the Assistant Commissioner of the Basim district, who reports that the state of the weather is "more reasonable than at date of last report," and "that crop prospects are brightening;" and further adds, "from 6th instant to date (20th) we have had considerable rain, and we may reasonably hope that the land which was suffering will pull through." H. R. C.

WE believe that the system of sowing single seeds in furrows, in which Mr. T. Login of Umballa has been so successful, and a short notice of which will be found in our issue of the 27th July, is essentially the same as the drill system referred to by our correspondent "ProBono Publico" whose letter we publish this morning; though the drill system, as pursued in experimental gardens, can advance pretensions to actscientific character, which is hardly claimed by the simple expedient of furrow sowing, which may be carried on without any particular description of implement. We speak, of course, from an amateur knowledge of the subject, derived almost exclusively from books and periodicals, and occasional inspections of indigo, tea, mulberry, and cotton plantations; but we believe that the two systems referred to above, if not absolutely identical, represent different degrees in the practical development of the same principle. Our correspondent's letter would have been more complete if it had contained fuller information regarding the details of the drill system, and the implements which are employed in it. We do not know whether Mr. Login's experiments at Umballa necessitate the use of peculiar instruments; but in Egypt, where furrow sowing is extensively carried on, the rudest agricultural implements suffice for all its purposes. So much indeed must be obvious from the fact that the only object which is kept steadily in view is to do full justice, so to speak, to each grain that is embedded in the earth. We should be glad to learn whether furrow sowing has been carried on to any considerable extent on inundated lands in Bengal; for, whatever interest may attach to experiments with cotton seed and indigo, all the importance of agricultural experiments centres round their adaptability to food grains, which are the staple products of Bengal.

Sowing in ridges, to which our correspondent refers, is very extensively resorted to in rearing mulberry plants in silk-producing districts, and the planting of tobacco seed on land somewhat elevated above the surrounding country is common in some portions of Orissa; but in both cases, the rigdes are compact masses of earthwork, undivided by fissures which would serve to drain off superfluous moisture. If, as seems probable enough, the raising of the land for mulberry and tobacco plants is done with the object of securing comparative dryness, or at least freedom from saturation in the soil, we have no doubt that this object would be still more effectually secured by scoring all such elevated lands with fissures or drains. We are not in the least surprised at the results which rewarded our correspondent's second ploughing of his indigo field; for the soil in tea gardens is invariably turned up more than once in the year, with material advantage to the shrubs—the implement employed, however, being the hoe, which is safer than a plough in a plantation full of trees.

In regard to cotton cultivation, we may remark, that one important experiment remains to be tried. In almost all the native cotton plantations that we have seen, the plant is sown annually, and perishes at the end of each season. Now, the cotton plant, if cared for, will live for several years; and we do not see why, as in the case of tea and coffee, and even mulberry, the labour of the husbandman should not be reduced to the annual collection of pods, and such pruning as may be required—the identical plant being preserved through several seasons, or for that matter, in perpetuity. Probably, the process which our correspondent explains, would suffice to preserve the plants from perishing after they have yielded their produce; and at any rate, it ought to be extensively tried. We shall gladly continue to publish any further information which we may receive regarding agricultural improvements in Bengal.

LATEST REPORT FROM THE BERARS.

THE following telegram was yesterday received by the Secretary to the Chamber of Commerce, from Mr. Rivett-Carnac, Cotton Commissioner, Central Provinces and the Berars:—

Akola, August 14.

"Cotton prospects in Wurdah valley and East Berar continue favourable; so also in Akola country. Around Akola, Khamgaum, and to the South, rain is much needed; and if further delayed, damage will result. Threatened portion comprises less than one-quarter of entire field."

The Planters' Gazette.

BOMBAY, 21st August, 1871.

THE ESTATES.

WE quote the *South of India Observer*:—

The report furnished by the Revd. G. Richter to Dr. Bidie, as to coffee prospects in Coorg, is certainly a favourable one. The unusually wet season in the Ghaut district seems to have been productive of beneficial results in Coorg, though from correspondents in Wynaad we hear that the moisture has been rather excessive than otherwise, which though undoubtedly good for the coffee trees, and a great boon to those estates in dry parts of the country which bore too heavy crops last year, have had the effect, in some cases, of preventing a considerable proportion of the blossom from becoming fertile. As a rule, in Wynaad, the heaviest crops are picked in those years when there is one general early blossom, not when it is split up into two, three, or four successive seasons of blooming. When the blossom comes out partly in each month, it will generally be found that although there may be a good scattered crop (a "sprinkling of crop") all over the trees, the clusters are small, and indeed often number only seven to ten berries in each, on the average.

We cannot but hope that Mr. Richter's remarks about the borer are inspired rather by fear than actual fact. A wet season, such as the planting districts have had this year, is very inimical to the class of beetles to which the "borer" belongs, and although certain places may suffer, we feel convinced, from trustworthy information received, that in most parts there is less appearance of this dreaded pest in coffee estates generally than there has been since the first great outcry was raised.

We do not however disagree with Mr. Richter's intention of deprecating any idea on the part of Government, that the "impending prosperity of the planting community" may make them more willing to pay the full amount of the land-tax, which they have been so long endeavouring, and apparently with a fair prospect of success, to get reduced. In Wynaad, on the contrary, the taxation is about to be increased; and the prosperity of the district must be great indeed, as we do not hear of a single complaint on this score. The local boards for raising funds on an acreage taxation have already met, and it is said that every estate will be assessed at 3 *as.* per acre additional tax, or "local cess," to provide for the upkeep of roads which do not come under the title of "Imperial;" for local buildings of a public character; and improvements generally. As there does not seem to be a single public meeting on this subject, it is but fair to conclude that the Wynaad planters are satisfied that their prospects quite justify them in this additional expense, and that the improvements will be beneficial, and may well be entrusted to Boards which are in no way responsible to them.

Mr. Richter's report would be more valuable if he would give us some reliable statistics as to the produce of coffee grown under original shade; the rashness of "wholesale destruction of virgin forest" may well be repented of, if it can be avoided, without loss of time (which is money) and interest to the planter; but in the districts nearer here it has generally been found that when the original jungle trees were left standing, the season of productiveness was delayed a year, or even two years, and in most cases that the yield has then and afterwards been small. In addition to this, the coffee is liable to suffer from damp, and from want of free circulation of the air, often causing "rot" and sometimes "bug." Do any of the native plantations, in Coorg suffer from either of these diseases?

We heartily congratulate the Coorg planters on their prospects, which we hope may be fully realized; and our thanks are due to Mr. Richter, for writing, and Dr. Bidie for publishing a report that gives to those interested trustworthy information as to the plantations.

CINCHONA.

REPORT OF THE COMMISSION.

THE report of the commission appointed by Government to inquire how the supply of bark from the cinchona plantation in Sikkim might be best utilized, and into other points relative to the health and cultivation of the plants, has been at last published in the *Gazette of India*. And now we are not much further advanced; for these inquiries have resulted in eliciting the most contradictory opinions from equally respectable authorities. All the persons engaged upon the Sikkim plantations agreed in saying that the cinchona is not likely to die out at Rungbee, that it will form forest there, and that the yield will grow annually larger. On the other hand, Mr. McIvor, from the rival establishment on the Neilgherries, "a most accomplished gardener and of more experience in Indian cinchona culture than any other man," assured the commission that the cinchona was *quite certain to die out* in Rungbee, that it will *not* form forest there, and that the yield will annually grow *smaller*. On the one side, those interested in the maintenance of the Sikkim plantations assert unanimously that nothing could be finer than the prospects of their cinchona; on the other, a high authority, disinterested in the Sikkim plantation, though perhaps partial to his own rival plantations on the Neilgherries, persists that the prospects of the Sikkim cinchona could not be worse. Yet the Bengal commission gives all its credence to the Bengali evidence. We hope it is right. Nevertheless, since the whole matter is one of opinion and prophecy, and since the opinions elicited are diametrically contradictory, we dare not rely on the pleasant decision at which the Commissioner prefers to arrive, without the corroboration of time. We shall know more about the matter next year, or the year after next. In the meanwhile the commission recommends "that the bulk of the stem bark be packed next cold season for sale in London, but that experiments on a considerable scale be made in manufacturing some of the residue at Rungbee." And to this we have no objection.—*Pioneer.*

GOVERNMENT concurs with the cinchona commission in thinking the prognostications of those experts who consider that the Sikkim plantations are on the road to rapid decay, far too gloomy, but promises, if their dismal conjectures should unhappily prove well-founded, to select other sites, where the subsoil is less cold and damp, and to open out other plantations—in a word "to persevere until it has secured for the fever-stricken millions of India the inestimable blessing of cheap quinine." No humane man but must honour this decision of the Government of India. All of us profess the faith that the revenues drawn from the Indian people should be spent for the benefit of the Indian people. Yet in how small proportion is this done, and how far fetched and elaborate are the arguments to prove that this and this great item of expenditure is disinterestedly incurred for the benefit of India! No doubt the protection of the people is the first debt which a Government owes to the governed. The cost of police for the protection of life and property may therefore be confidently put forward as a public charge, though it is a pity that the protection is so inadequate and alloyed by so much oppression. The same plea may, to a considerable extent, vindicate the enormous military expenditure. Security from anarchy or invasion is the previous condition of all other well-being, and the army provides this. The money spent in protection against famine, by well-considered irrigation works and auxiliary roads and rail-roads, is an equally legitimate (or, we should say, equally bounded) object for public expenditure. It is one also which the public of India can more generally appreciate. Education again may be argued to be of still greater public profit, since it is the door and access to almost all other blessings. It is ignorance which makes vaccination unpopular, but there is no expenditure more clearly righteous than is incurred in providing protection against small-pox. If, however, there is one holier, more incumbent outlay than that on vaccination, it is that which Government is employing "to secure for the fever-stricken millions of India the inestimable blessing of cheap quinine." For want of quinine, the populations of other extensive districts are now dragging on their joyless years in a chronic state of degraded vitality. To make quinine available to the people at large is, in the plainest and truest sense, to use the people's money for the advantage of the people. It is desirable that quinine should be the cheapest of all medicines in India, since it is that of which the poor have most need. We thank and congratulate Government for its determination not to desist from its efforts until success is obtained, or proved absolutely to be unattainable.—*Pioneer.*

THE *Gazette of India* contains an elaborate collection of papers, relating to the cultivation of cinchona, and the manufacture of quinine in India. On the 2nd February 1871, the following resolution was passed by the Government:—

> That the cinchona plant, *c. succirubra* or any other, can be grown to any extent in British Sikkim, has now been definitively established by the results that have already been achieved in the Government plantations. And the Governor-General in Council fully believes that at little present cost, and with a certainty of considerable future revenue, forests of cinchona may be reared in Sikkim, which, by furnishing large quantities of quinine, may hereafter prove a blessing not only to India, but to the civilized world.

On the 29th June the Secretary to the Government wrote:—

> As regards the first point, *viz.*, the cultivation, it seems clearly proved that *c. officinalis* is unsuited to the soil and climate of the Government plantations in Sikkim. It has been tried at various elevations without making any progress, and its extended cultivation would be unprofitable. His Excellency in Council therefore agrees in the recommendation of the commission that its further propagation should cease.

Between the two periods the plants seem to have suffered greatly, and some of the favourable opinions expressed at the outset were considerably modified as above. The Governor-General, however, has not by any means given up the project. As many plants as possible will be left standing for future observation, and experiments with other species of the plant will be made.—*Friend of India.*

BOMBAY CINCHONA BARK.

Mr. Broughton, the Madras Quinologist, has reported to Government, the results of his analysis of two specimens of red bark from Mahableshwar. The specimens of bark differed in appearance from most of the India grown bark of *c. succirubra* by having a thicker corky envelope, which had partially scaled off its surface in many places, and thus altering its aspect. This was more especially the case with the elder bark. The analysis are given in percentages of *dry* bark:—

	Per Cent.
No. I.—C. Succirubra bark, four years old.	
Total alkaloids	5·95
Quinine..	1·06
Quinidine and other alkaloids	4·89
Sulphate of quinine obtained crystallized	0·75
" of quinidine and cinchonidine	3·16
No. II.—C. Succirubra bark, three years old.	
Total alkaloids	5·34
Quinine..	0·57
Quinidine and other alkaloids	4·57
Sulphate of quinine obtained crystallized	0·39
" of quinidine and cinchonidine	2·40

Hence, in gross yield of alkaloid, these barks are of good quality, the elder being of course the better. They bear all the marks of being grown at a lower elevation than those of the Neilgiri plantations. It will be observed that they contain little quinine. The most remarkable quality of the barks is that they contain but a little cinchonidine, compared to the usual yield of red barks; that alkaloid being nearly entirely replaced by quinidine, an alkaloid of somewhat greater value, and not hitherto found in any large quantity in Indian barks. Hence, after the quinine is removed of solution of the sulphates, rotates the plane of polarization of a polarized beam to the right. The occurrence of this alkaloid is a circumstance of much interest. Cinchonine is also present, and is excluded from the above statement of crystaline sulphates.

TEA.

THE TEA-PLANTERS' MEMORIAL.

From C. U. Aitchison, Esq., C. S. I., Secretary to the Government of India, Foreign Department; to R. B. Davidson, Esq., Cachar, dated Simla, the 30th May 1871.

Sir,—In reply to the memorial of the tea-planters and the European residents of Cachar and Sylhet, forwarded with your letter of 25th April, I am directed to forward, for your information, and that of the gentlemen whom you represent, a copy of letter No. 429 P, dated 1st March 1871, addressed to the Secretary to the Landholders' and Commercial Association of British India.

That letter contains a full exposition of the views and policy which, after mature consideration, His Excellency the Viceroy and Governor-General in Council has deemed it right to adopt, in respect to the defence and protection of these districts.

His Excellency in Council confidently hopes that the measures which have already been taken, and the measures about to be adopted, will have the effect of ensuring in the frontier districts of Sylhet and Cachar an amount of security which has never yet

[illegible] will [illegible] the [illegible] which have actually [illegible] in the [illegible] have the honour to be, Sir, your most obedient servant,

A. T. ARUNDEL,
Secretary to the Government of India.

WATER FOR TEA MAKING.

A writer in the *Food Journal* says there can be no doubt that soft water extracts the colouring matters of tea. It makes it look stronger, and this suits the fancies, doubtless, of a people that love appearance and outside show. But the true tea-lover soon discovers that the beautiful flavour of the tea-leaf is obtained far more perfectly when a somewhat hard water is used for its preparation than when a soft water is employed. Coarse forms of extractive matter, marked by a very bitter taste, are in this way obtained from tea, which have the power of entirely destroying the aromatic principle, that delicate flavouring, with which consumers are so familiar. It is, however true, that too hard water is a great misfortune as too soft an one. There can be no doubt that our London waters are perfect for tea making. This was a subject of Government inquiry. Carbonate of soda makes the tea dark, but if you care for taste and flavour, I should strongly advise banishing the carbonate of soda bottle from the tea table. There is one point to be remembered, and that is, that the brewing process with a hard water is a rather more tedious one. Using three samples of water, one of 2·0, another of 5·0, and a third of 8·0 degrees of hardness, and after boiling and experimenting in each case with the same quality of tea, I should say that five minutes was long enough, in the first experiment with the soft-water, for the tea "to draw," whilst at least a quarter of an hour is necessary with that of 8·0 degrees, and about ten minutes that of 5·0 degrees.

TEA BUG.

THE "Norfolk Howard" of tea *is* a troublesome intruder on plantations. A letter just to hand from an esteemed correspondent in Upper Assam, speaks thus of it:—

"I have but lately sent you a few cursory remarks on the white blister blight that has rather seriously affected the out-turn of many tea gardens in Upper Assam. The subject of my letter was worth noticing as expository of one of the two main causes of destruction to *young leaf*. I now take up the other—tea bug. It is strange that this mischievous annulose enemy never touches maturely grown leaf. He deliberately sets to work on a given system to compete with the planter, by attacking the shoots which are the subjects of the most anxious watchfulness. Many smuts and rusts are found on tea, but old leaf appears to enjoy very large, if not total immunity from, bug, and in most cases smut may be said to be a proof of old age. Plants ranging up to 2 years old, are also comparatively free from the attacks of this destructive foe. But the havoc caused by him—the planter's pest—is often so considerable as to impart a brown withered look to a tea garden, not unlike that caused by white blister, to which the appearance is often attributed. Bug generally shows about May, in the form of a small, pale, wingless insect, not more than ⅛ or ¼ of an inch long, when its power for mischief is not great. But as the season advances, it increases in size to ½ or ¾ of an inch, deepens into an orange colour, and covers the young leaves with dark specks, by puncturing them all over. Towards the close of the season, its head and thorax become black, its wings develop, and it is able to fly from bush to bush defying every artifice and ingenuity to ward off its malignant attacks. I have closely watched the manner in which it exercises its destructive capabilities. The leaf is repeatedly punctured, the spots become brown, and the leaf assumes the same appearance as when the tissues oxydize in fermentation. Like all belligerents, this wicked little bug has its enemies, and among them an ichneumon, from whose rapid movements the victim cannot escape. In the early part of the season, a clean garden will suffer less than a jungle, from the inroads of this pest, as owing to its inability to fly, its depredations are confined to those portions or bushes where it first comes into existence. In full bearing a garden will suffer heavily, often as much as twenty per cent. on the crop. It does not follow, however, that the trees are exhausted as in blister blight, which is very impoverishing. In concluding my notice of tea bug, I may add that this insect should not be confounded with the large brightly coloured one so often found under tea leaves; bug is, when full grown, not much larger than an ordinary musquito, and its presence in a garden is invariably evidenced by leaf and shoots becoming spotty, dark, and surly."

MAXIMS IN TEA PLANTING BY AN ANCIENT DIBBLER.

The less a tea planter knows of general and special botany, and of the structure and functions of the tea plant, the more certain he is of success and of realizing an early and simply [illegible]

[illegible] chemistry, he cannot know too little, and the more he disregards this branch of knowledge the [illegible]

These two subjects, viz. botany and agricultural chemistry, are by a few so called scientific but visionary individuals said to constitute the basis of all profitable horticultural and agricultural operations. But let the Indian tea planter beware of such ridiculous accidental theories, or he will certainly come to grief.

When purchasing tea seed be sure to select the very freshest sort. In this way you will secure an important numerical advantage, the absence or atrophy of the kernel being of no practical importance.

The due preparation of the soil, prior to the laying down of the seed seed cause no anxiety. Nature is a kind auxiliary, and the more you leave to and the seldomer you interfere with her, in this respect, the better. Refrain from disturbing the earth's crust as much as possible, and in depositing your seed, use simply the dibble. The harder the ground, the better.

Six feet by six is the proper distance between plants, and as you dibble, take care not to insert more than one tea seed at each of these points. It is better to run the not unlikely risk of each single seed not germinating, than that of being too successful by the other exploded system of implanting five or six seeds in elaborately prepared "thullies."

In planting out seedlings, let them be exposed to the sun for as long a period as may be practicable—say from three to four days—and never transplant your seedlings, unless the weather be perfectly dry and likely to continue so for several days.

Your tea seed or seedlings being put into the ground, let them alone— or, at all events, cut or uproot the closely surrounding and enveloping jungle vegetation only after the most judiciously protracted periods of non-interference. In this way much trouble and unnecessary expense will be avoided.

Should any of your plants in the course of three or four years have by any chance come to be profitably productive, weigh seriously the happily alternative of heavy wholesale pruning, and judge, whether it be not wiser to defer for a few years the realization of a large out-turn, in the hope of everything turning out for the "best." "Simple faith' will in this case be found to work wonders.

Unbelievers nickname this proceeding 'mutilation'—but mind not the reviling of scoffers.

Should you find the operation of fearless amputation unequal to your just expectations, cut down your plants to the ground, and should you still fall of well-merited success, then turn your attention to the roots, and more particularly the tap-roots, and these remove boldly and without the least fear of injurious consequences. In this manner the most perfect system of pruning is carried out, and the most beneficial results may be expected.

Should you ever happen to have 'a flush,' 'rest on your oars and be thankful;' let it alone, or, at any rate, so direct your pickers, that 'the appearance' of your garden may not be injured by one plucking. To the really well-informed and judicious planter 'the appearance' of one's garden must always far outweigh all paltry pecuniary considerations.

The less you cultivate, the better; this final maxim is never so peremptory as during the season of harvest."

JONAS DEVILSKIN.

Darjeeling, 25th July 1871.

COFFEE.

MYSORE COFFEE TREES.

A correspondent of the *Bangalore Herald* mentions that "a few of the Mysore planters have come to the conclusion at last that the tree they have been growing for so many years is a mistake, and have obtained seed this season from Coorg and Wynaad. It has long been felt to be a drawback that the kind of tree generally grown in Munzerabad, viz., the 'chick,' will not give successive crops, for the simple reason that it will not bear a crop and grow new wood at the same time, so that a planter in these parts has generally got a patchy estate as regards crop, and his reply, when it is remarked on is, "Oh, that part gave a good crop last season." Now what is called here the "common" tree, and is known in Wynaad as the "Mocha" tree, is an entirely different chap, and far more regular in its growth. Of course, we don't expect larger crops by the introduction of the new plant, as shade will have the same effect in keeping off excessive crops on one tree as well as another, but we do expect more regularity."

SALE OF COFFEE PROPERTY IN COLOMBO.

Venture estate, situated in Dickoya, of 300 acres total extent, 200 being fine forest land, was sold to-day at public auction, by Mr. Gabriel, for £1,640, the purchasers being Mr. Gabriel and others. The block of land called Eliyakelly, in Madulsima, belonging to the estate of G. John, was this day purchased at auction, by Messrs. Lee Hedges & Co., for £210, the extent being 211 acres of forest land. The estate of Hindagalle in Kurunegalle, near the Rambukkan station, bought by the same firm, fetched

£35 for 150 acres!—a fancy price, only parallelled by the case which occurred the other day of a coffee estate sold by a mercantile firm in Colombo for £300, with three years to the purchasers to pay the amount. Verily, coffee property is taking a turn in the estimation of the public; but it must not be forgotten very probably under other circumstances such places would have simply been abandoned.

We observe, in the home papers, received by last mail, that the prospectus of "The Beechlands Coffee Estates Company," which was being formed "with the object of working and extending the cultivation of the Beechlands Coffee Estates, situated in the district of Coorg, in the East Indies, and of acquiring the Government grant and the buildings and plant upon the estate." The capital of the Company is proposed to be £75,000, in 7,500 shares of £10 each. The purchase money is £25,000, three-fourths in cash, and the balance in fully paid up shares, upon which no dividend will be paid for any of the years, 1871-75; unless a minimum dividend of 5 per cent. in each year is paid to the holders of the first issue. The first issue is to be of 3,750 shares, and the second issue of a similar number of shares, is to be devoted to "acquiring, when opportunity offers, and cultivating other estates in the same or neighbouring districts." The crops of 1869 and 1870 are stated to have been 48 and 58 tons respectively. Amongst the directors, we observe the names of Mr. P. E. Bendir, and Mr. John Tanner, both late of Bombay. It is to be hoped that the scheme was floated, before the news of the "borer" having again made its appearance in Coorg reached London. Irrespective of that entymological difficulty, the prospectus will present a tempting prospect to some home investors. But if the shareholders are men of ordinary prudence, they will wish to know all about the managers of the estates, and also how control over the management is to be retained through a remote London office.—*Times of India.*

THE APPLICATION OF MANUFACTURE TO THE COFFEE-PLANT.

It gives us much pleasure to place before our readers the following memorandum, respecting manuring sent by the Director of the Botanical gardens, Peradenia, in answer to an application made to him by a planter for his opinion on the vexed question of shallow or deep manuring:—

"It is true, as you state, that the coffee tree has a tendency to be a surface feeder to a very great extent; still, if the soil is suitable for it, a very large number of roots are found at a considerable depth. It is, of course, desirable to encourage the development of these deeper roots, as well as of the more superficial ones; the plant has then more feeding space, and is moreover less liable to suffer from wash and drought.

The application of manure, just immediately under the surface of the soil, would doubtless succeed very well under the following conditions:—

1*stly.* The soil light and porous enough to allow the soluble portion of the manure to pass freely through it for the nourishment of the deeper roots.

2*ndly.* The surface of the soil shaded by the over-hanging branches of the coffee trees, or protected by a littering of manna grass or other vegetable matter.

3*rdly.* Excessive wash provided against by a thoroughly good system of draining.

If the above-named conditions are not present, I should recommend the manure to be applied in holes or trenches 1½ to 2 feet deep, narrowing towards the bottom. I would have the manure well mixed with the greater portion of the soil taken out of the holes or trenches, and this mixture after being thrown into them, covered up by the remaining portion of the dug-out soil

As it cannot be supposed that there can be a very frequent application of manure to a coffee estate, it would seem desirable that in this wet climate, a *slowly* soluble manure should be employed in preference to a rapidly soluble one, since much of the latter would probably find its way by filtration into the streams, instead of remaining gradually available for the nourishment of the coffee plant."

COFFEE PLANTING IN BRAZIL.

The last number of the *Anglo-Brazilian Times* to hand, contains some particulars relating to the cultivation of coffee in the San Paulo district of that country; a perusal of them in a condensed form will no doubt be interesting to many of our planting readers.

A great deal of the work on estates in Brazil is done on the "job" system by small free middlemen, or large contractors owning a good number of slaves.

The principal plantation jobs are constructing buildings, clearing land, and harvesting coffee.

The cutting of the bush, felling of the large timber and burning, are paid for at rates varying according to circumstances, from £2 to £5 per alqueire, equal to nearly six acres.

The contract for forming a plantation of coffee extends over four years. The contractor either receives the land in its virgin state of forest, or already cleared and burned. He finds his own house and food, plants with seeds or seedlings, at 10 feet 10 inches to 13 feet apart, cultivates and replants where failures occur. In compensation, he has the use of the ground between the rows, so far as not injurious to the coffee plants, but is generally bound not to grow rice, tobacco, or cotton, receives the coffee produced, the trees bearing a little from the second year, and is paid at the expiration of the term, at the rate of 4*s.* for every plant four years old, and correspondingly for those of less age.

We must state, however, that whenever the age of coffee trees is spoken of, it means the time since they were transplanted from the nursery, not the real age. When transplanted, the seedlings are usually 1 to 3 years old.

Contracts are sometimes made for the hoeing and gathering of coffee, or for the one work alone. The hoeing is done five to six times a year, and is generally contracted for only while the plants are under five years of age, after which age camaradas or colonists are preferred to the regular jobber.

The contractor engages to give a certain number of hoeings in the year, and to replant the failures. For the service he is paid from £2 to £6 per 1,000 trees annually, and 2*s.* to 2*s.* 6*d.* a bushel, for the fruit gathered by him; besides which, he has the use of the spaces for harvesting without food.

As the annual production of the slave on a well-managed coffee plantation is £80 to £100, besides the food he consumes during the year, the annual product of a fazenda, with 50,000 coffee trees, employing 25 slaves, and yielding on an average 5,000 arrobas, of 32 lbs. each, should be £2,000 to £2,500, the outlay for obtaining which would be so that the expense

Cost of the fazenda in its 5th year, about	£7,500
Cost of 25 slaves	5,500
	13,000
If colonist labour were employed alone, the outlay of the planter should be diminished to about	8,500

of organizing a free labour coffee fazenda is only two-thirds of that required for slave fazenda of equal production and quality.

The Brazilian land of measure, an alqueire or nearly six acres, about 2,000 coffee plants, 10 feet 10 inches to 11 feet 7 inches apart both ways. While the plants are under 5 years of age, maize and beans are frequently raised in the spaces between the rows.

It is calculated that a labourer can take charge of 9 acres of land, having 3,000 coffee trees under 5 years old, and, besides cultivating the coffee on it, could obtain from it 250 bushels of maize, and 50 of beans, in the year.

Coffee trees are reckoned to yield, from their 5th to 20th year, an average of one arroba of 32 lbs. of clean coffee to each ten trees. From 6 to 12 years old, the product is commonly two arrobas, and sometimes even three arrobas or 64 lbs. to the ten trees, but from the 16th to the 20th year, the crops are irregular below the average given. However, in old age, the bushiness of trees keeps down the weeds and grass, and reduces the amount of cleaning needed.

The common yield of clean coffee from the fresh fruit is about 32 lbs. to three alqueires. An alqueire is very nearly equal to an imperial bushel. An arroba of clean coffee is obtained from one and a third arrobas of dry coffee in hull, deprived of its pulp, by beetling, washing, or otherwise, but not of the parchment-like envelope, enclosing the two halves of the bean.

The following figures shew the cost of opening and working a coffee plantation in San Paulo, with the ordinary result:—

COST OF A COFFEE PLANTATION.

900 acres of land of good quality, 300 fit for coffee, in one of the best coffee districts, nearest Jundiahy, at £20 per alqueire of 6 acres	£2,000
Clearing and burning 150 acres, for 50,000 coffee trees, at £1 per alqueire	100
50,000 coffee trees, 4 years old	2,000
A terrace for drying coffee, one-fourth tiled, 95 yards square, surrounded by a mudded wall of 3 ft. 9 inches high, 17 inches thick, 36 inches at foundation, plastered	250
A barn, 36 feet frontage, 21 in depth, and 15 high	200
Cart, picking and mill shed, of timber, 108 feet long, 21 deep and 15 high	200
Grain store and mudded walls	100
Hospitals	30
Store for provisions	50
Dwelling house	250
Huts for the 25 slaves needed to do all services of the plantation	200
Tank for washing coffee, 15 feet long by 3 feet wide	25
Waggon	60
Water-mill and beetles	35
Boxes for coffee	40
Ventilator	30
Total	£5,600

If colonists, instead of slaves, be employed, their houses would cost from £30 to £40 each.

But the above sum of £5,600 does not include interest of capital during 4 to 5 years, furniture, utensils, implements, tools, animals, roads, pastures, and other accessory expenses, so that a plantation of the size and culture estimated is valued, at least, at £7,000 to £8,000, exclusive of slaves and modern agricultural implements.

The average crop of coffee produced by 20,000 trees, 5 to 20 years after planting, would average [illegible] lbs. each, [illegible] 4,000, [illegible] during the 6th to 10th years. Besides the coffee, 20 [illegible] would raise the food consumed on the plantation.

From the above statement it appears that whilst the cost of clearing, planting, and bringing into bearing an estate of 150 acres of coffee, containing only 300 trees to the acre, is far more than that of a similar plantation in Ceylon, the returns are much larger per tree, average nearly 10 cwt. per acre, and as a rule, continue in bearing for twenty years, which can be said of only some districts in Ceylon, at any rate, to yield anything like profitable returns. One hundred and fifty acres of coffee, costing £8,000 without value of slaves in all as stated £15,000, will yield in coffee, worth at the port of shipment, after deducting packages and cost of transport, £2,500.—*Ceylon Times.*

COORG SEASON REPORT

For the first half-year of 1871.

Mercara, 1st *July* 1871.

My dear Dr. Bidie,—It is again my pleasing duty to send you one of my periodical reports on the agricultural condition of Coorg, and I am happy to state that the review on the past six months entitles us to very hopeful prospects.

Regarding *coffee*, our spring season has been all that could be desired. The much-dreaded hot east winds from January to April, have been tempered by an unusually frequent and copious rainfall that reached every part of the country, and the consequent luxuriant growth of "new wood" on the coffee trees, so soon after heavy crop, was truly astonishing, and imposed on the planter a practical "handling" of the welcome phenomenon on a larger scale than he was prepared for. But still more grateful to his eye must have been the immediate prospect of a fine crop by the abundance of blossom at three succeeding periods. That in January and March was the most fertile, but in the Bambu district, the flowers of April also set largely. Hence the forthcoming crop is expected to equal if not to surpass the last, which has been a very good one, but the total amount is not yet officially known.

This impending prosperity of the planting community, which, if unqualified, may mislead Government in its dealing with the planters' memorial for reducing the coffee-assessment, is, however, not unalloyed by a considerable amount of apprehension and despondency; for the relentless foe, the dreaded "borer" is still here at work, undermining with his insidiously hidden operations, the hopes and prospects of many a hard-working planter. The months of April and May have revealed on many a coffee estate an extent of destruction, which to the planter is as sickening a sight as the demolition of the far-famed palaces of Paris to the lover of art! Of all the remedies—and new ones have to my knowledge not been attempted against the "borer"—that which is still considered the most effective is the stamping out the living brood in the ruin of its own creation—the burning of each "bored" tree.

New planting by Europeans and Natives has been considerably extended, and the latter stick to their old method of partial shade-planting under forest trees, a method which many a European planter ruefully contemplates, when looking over the shadeless area of his bare coffee plantation, or upon the exhausting growth of the charcoal tree, under which his coffee seems to suffer, and which he is now anxious to exterminate. Seeing here and there on estates half-dry sticks, intended for future shade trees, struggling for existence, offers a sad comment on the repented rashness of wholesale destruction of virgin forest, and the truth starts vividly to one's mind, that it is easier to demolish than to build up!

The coolies are this year rather late in making their appearance, and the weeds, favoured by the rains, have taken advantage of their absence, and grown to a height that will even hide the coolies, when on their return their first business will be to wield their grass-knives to cut down the weeds, a proceeding which has found favour with most planters, instead of weeding with the hoe, during the monsoon.

The early rains have also greatly benefitted the growth of *cardamoms*, upon which more care is now bestowed than formerly, so we shall soon hear of cultivated cardamom gardens instead of the crude native growth of the spice. The value of Coorg cardamoms—Rs. 6-7 per pound in the London market—is so tempting, that it is surprising that this cultivation which is so cheap and easy has not been more attended to by the European planter.

The cinchonas (c. succirubra) grown in Coorg are thriving well, both at the small experimental garden belonging to Government, and at various localities—coffee plantations, Kacherias and Coorg houses—where seedlings from the central school nursery have been transplanted. The result of the analysis by Mr. Broughton of bark taken from six-year-old trees in the Government garden shows:—

Total alkaloids	0·28
Quinine	1·04
Amorphous alkaloids (cinchonidine)	1·19
Crystallized sulphates (quinine)	0·60
Do. cinchonine	0·11
Total crystallized sulphates	0·72

"This analysis," Mr. Broughton writes, "I consider satisfactory. It yielded its large amount of crystalline sulphates with greater ease, than is usual in barks grown at low elevations. Like nearly all red barks grown in India, the greater part of its alkaloids consist of cinchonidine, a defect especially attaching to those which, like this, are grown at a site of comparatively small elevation."

Cinchona seed is now annually produced in large quantities, and freely distributed to anyone who asks for it.

I am in daily expectation of a number of seedlings of the *theobroma cacao* from the Mysore Government, and hope, under more careful superintendence, to see this valuable acquisition to our local resources, fairly established in Coorg.

* * * * *

G. Richter.

MERCARA SEASON REPORT.

The season report in Mercara, in the first half of the present year, has so far been very satisfactory. The hot winds in the months of January to April have been accompanied by good showers of rain, and the luxuriant growth of new wood on the coffee trees has been most astonishing. The next crop it is expected will be equal if not surpass the last which was a very good one, but the total out-turn cannot at present be accurately estimated. The Reverend Mr. Richter says in his report:—"New planting by Europeans and Natives has been considerably extended, and the latter stick to their old method of partial shade-planting under forest trees, a method which many a European planter ruefully contemplates when looking over the shadeless area of his bare coffee plantation, or upon the exhausting growth of the charcoal tree, under which his coffee seems to suffer, and which he is now anxious to exterminate. Seeing here and there on estates half dry sticks, intended for future shade-trees, struggling for existence, offers a sad comment on the repented rashness of wholesale destruction of virgin forest, and the truth starts vividly to one's mind that it is easier to demolish than to build up." Cardamom planting has also been materially benefitted by the favourable rains, and it appears that the planters, encouraged by the success which has attended their endeavours, are likely to extend operations to a considerable extent. The cultivation and manufacture of fibres is said to be very satisfactory, and the first crop of paddy reaped in North Coorg, in the month of May last, turned out very well. The fall of rain from 1st January to 30th June 1871, was 41·14 inches, against 36·17 inches in the corresponding period of last year.

SURFACE MANURING IN DIMBOOLA.

Dear Mr. Editor,—I have read several letters about surface-manuring: this may be practicable on flat ground, but fancy manuring on the surface in Dimboola, when we have actually not seen the sun for a month, and raining from morning till night. A most enterprising proprietor in Dimboola has actually manured on the surface, and the result probably will be that he will have a Mauritius grass field very soon.

We had a frightful rain of late, so much so, that tappal coolies and provision coolies could not cross the river; therefore, do your best to advocate a bridge across the Kotmalie Ganga.

The bandy road, I am glad to say, is progressing favourably and we soon shall have it as far as Logie estate.

Crops will be very fair this year, and a very good average per acre on most estates.—Yours faithfully,

Dry Weather.

Dimboola, 8th *July* 1871.

PRINCIPLES OF MANURING: THE STUDY OF THE SOIL: ORANGERIES AND COFFEE PLANTATIONS.

Dear Sir,—The subject of manuring is under discussion in your columns, with a view, I presume, of not only ascertaining the proper mode of application and its results in different districts, and on such a variety of soils as the coffee regions of this country exhibit, but if possible, to set at rest the all-important question about which there are grave doubts—*will manuring pay?* I very much regret having mislaid Mr. Josiah Mitchell's letter on the orange groves of Parramatta, as the distinctive mode of cultivation there described, and only arrived at after 50 years' practical experience, struck me forcibly as the one best adapted to similar soils in Ceylon, cleared for the growth of coffee. To the best of my recollection, the letter stated that the soil of the plan-

tation in question, the finest orangery in New South Wales, was of the thinnest and poorest description, with a free and open subsoil; the mode of cultivation was to fell, clear, drain, and plant, as is done for coffee in this country, taking care to keep the ground free from weeds. When the time for manuring arrived, the practice, which for many years had been followed with the greatest success, was to loosen the soil round the trees to the depth of 2 or 3 inches, applying the manure to the surface. Several kinds of artificial manures had been tried from time to time with varying results. Superphosphate, I believe, was found to answer best, that is, it gave the most profitable returns, and at the same time maintained the trees in a vigorous state of health. Now this is exactly what we coffee planters in Ceylon are racking our brains to arrive at. We want the introduction of a manure easy of application and which, while it yields us a profitable return, keeps our trees in a healthy and flourishing condition. How are we to arrive at a knowledge of this. Not certainly by following the beaten track of the clodhopper, applying indiscriminately all kinds of soils; no, we must endeavour to find out, aided by scientific research, observation, and practice, the kind of manure best adapted to our soils. It must not for a moment be supposed that because superphosphates acted so admirably on the thin poor soil of Parramatta that the same manure will operate in a similar way on stiff land, or on land with a free surface only, but it may be safely inferred, I think, that land of a similar nature to that described would reap a similar benefit from this application of such manure. In fact, the *soil* must be studied before we can, by the aid of manures, arrive at the desired result. It's true, blind practice sometimes leads to the same result as that of study, but it is a round-about and expensive way of going to work, and not at all necessary in this enlightened age of agriculture, leading the unthinking astray.

I have little doubt but at this present moment in Ceylon, there are thousands of tons of the best fertilisers lying dormant in the soil, or in other words, so many tons of manure *out of place*.

Many are the varieties of manure I have applied in my time, and I am free to confess that in many instances experience has proved that the blame cast upon the manure, where no satisfactory results followed, ought strictly and properly speaking to have been thrown on its mis-application; but the possibility of such a thing never entered our heads at the time, consequently the manure was condemned, not as unsuited to the *soil*, but as unfit for *coffee*, and something new sought after to be in its turn spurned upon principles entirely erroneous. The nature of the soil to which the manures were applied being of secondary importance, the fact that it grew a coffee tree being deemed sufficient to justify the application of the most approved of fertilisers as they from time to time appeared before the public, described as the *thing* for *coffee*. From what I have said, you will see that I am no advocate of the so-called *thing* for *coffee*. Planting energy, observation, and experience ought to be directed to the requirements of the soil. That the best fertilisers may be misapplied, I know from experience; that they may be made useful and reproductive, the nature of the soil must determine; for as I have said before the nature of soil requires to be studied in order to ensure success and obtain the most favourable results. In the application of stimulants, the object is to add to the soil that which it is in want of in the shape of stimulant. In the application of such bulky manures as cattle manure, pulp, &c., the action is different: we not only add a stimulant, but we make a new soil out of the bulky ingredients applied.

As to the mode of application of the different kinds of manure: so long as the land is protected by drains from wash, I am in favour of surface manuring to a depth of 2 or 3 inches for all stimulating or artificial manures, easily dissolved; for it stands to reason that where the land is protected from wash, manure thrown on the surface, if it does not wash off the soil, must wash into it. Bulky substances ought to be placed deeper to facilitate decomposition, leaving it to the power of the sun's rays to bring their nutritious qualities to the surface to be carried down into the soil again by the first rains, and taken up by the feeding roots. Hereafter I may be able to give you my experience of the different kinds of manure and their effects on the soils to which they were applied.—Weather wet and stormy, splendid planting weather, but interfering sadly with field labour, making it expensive in every way.—Yours truly,

D. M.

July 12th, 1871.

SURFACE MANURING THE RIGHT COURSE, FRUIT-TREES SO TREATED AT HOME.

Sir,—Like many others, I have taken a deep interest in the discussion on coffee cultivation, which has been going on in your columns for some time back, especially when at the commencement you so kindly and gravely hinted, that the Dimboola and Dickoya lads had better keep their eyes open, as the "experience of years gathered under a tropical sun on the hills of Ceylon long before they had left their nurseries," through the fatherly kindness of their mentor, was to be duly laid before them for their special benefit.

Well, the first illumination from the said fountain of light surely did rouse within them every feeling of gratitude, viz., 2 feet drains. Although perhaps followed by the not very pleasant thought of an augmentation of the death roll in their not overstocked labour ranks, to say nothing of broken bones and hospital charges, or worse still, the 200 acres reduced to something like 150. Unfortunately nothing more was said on the subject, and the writer did not say if he had tried them or not. On the question of supplying manure, a step in the right direction seemed to be taken when "shucked coffee-tree" began to talk, only to be followed, alas! by a counterblast in favour of tap roots. Could you blame the lads or anyone else for feeling rather drowsy when reading, that 26 years' experience had reached nothing better than the "old and expensive 2 feet holes." After all it's not much to be wondered at. It took fruit-growers, in other parts of the world, much longer time than that to find out their great mistake in deep manuring. It's only within 10 or 15 years, the fruit-growers in England have found out by experience that surface and not subsoil manuring is what suits their interests best. The system which they practise is to cover the ground around their trees with cattle dung in autumn, thereby serving the double purpose of protection from the winter's frost and enriching the surface soil. In spring, the manure is removed to be replaced by a fresh supply, or dug with a *digging fork* according as their trees require it. And every precaution is used to prevent the trees making taps or subsoil roots (the handle of Mr. Ward's theory), and before planting, the hole dug for the tree is half-filled with stones or concrete. In some cases the bottom is laid with slate as close and regular as they are laid on the roof of a house, to prevent the possibility of a single root getting beyond the depth allowed. Mr. Ward appeals to nature, giving the tree a tap root, as a reason why it should be manured. Looking at the coffee trees on our estates, can anyone say they are left in a state of nature? Is it natural for coffee to have its top lopped off when it reaches 3 feet high, or to have its branches pruned and handled two or three times every year. Then, if we outrage nature so much above ground, why should we follow a tap root 2 feet below ground for no better reason than that nature put it there. However, Mr. Ward gives a reason by making it, as he says, "yield force and vigour to the tree above." And he thinks there cannot be two opinions about the superiority of his theory over that of surface manuring, or as he puts it, roots round the collar. But the present discussion has shown that there are more than two opinions on the subject, and if the question of surface and subsoil roots be carefully considered, the number of opinions in favour of the former will be legion. Did it ever occur to Mr. Ward how much subsoil roots had to do with short crops. It may be a very easy way, though not very satisfactory, of getting over the difficulty of short crops by saying "we lost our big blossom; too much rain this year; we had no blossom too wet." Is that to be repeated year after year, it is surely high time to enquire in what way too much rain affects the trees to prevent them giving crops. Various reasons may be found, but the chief cause will be found in subsoil roots, which in every case more or less retards the tree from bearing fruit, and when we get a little more moisture than ordinary at the blossoming season, these effects are too plainly shown in the year's estimate. Much better treat the roots at hand well, than go digging down, encouraging the tap root to send out lateral roots into holes dug by its side, which (in higher wet districts with a retentive subsoil especially) is simply a recipient for water where dryness is most needed, and when a tap root would be better dispensed with altogether. If more were done to prevent the roots going below half the depth proposed for the manure to be put, and as carefully tended as the branches are, there would be less need for manure and fewer short crops. But if the deep manuring system be carried on, it will be the old story. "Well, it bore capitally when it was young, so it did, but the roots are now deep in the subsoil." Nothing was done to prevent them, but the reverse; manure was so applied as to encourage them into it, so there is nothing for it but to blame the manure, and find fault with the mode of application, and discuss the subject (the best manure for coffee and how to apply it) over and over again, and the only mark of progress 26 years hence, will be a few more abandoned estates, and not a few additions to the shucked list.

Yours faithfully,
SURFACED ROOT.

COFFEE STATISTICS.

For our coffee-planting readers, the following statistics will have an interest:—In the ten years, from 1861 to 1870, the coffee-growing countries produced nearly sixty-eight millions of hundred-weights of coffee. Of this, Rio alone produced considerably more than a third; while our part of the world, in sending into the market the kinds designated as East Indian, has supplied less than the thirtieth part of the whole. Ceylon is now pushing Java hard for second place, as regards quantity,

in the produce market; East India which, in the first half of the [illegible] was about [illegible] Ceylon, and competing with Langsayra.

	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
Rio	3,610,400	2,799,400	1,994,400	1,875,100	2,165,700	2,361,800	3,184,400	3,274,000	[illegible]	[illegible]
Santos	359,100	418,000	397,400	298,100	459,200	395,500	362,100	360,000	[illegible]	714,100
Bahia	72,000	84,600	90,100	59,700	186,000	92,500	197,900	119,600	126,100	148,100
Costa Rica and Guatemala ...	54,200	48,400	65,400	55,200	72,600	98,800	130,200	126,700	[illegible]	[illegible]
Langsayra and Mocha ...	295,000	317,700	352,600	424,000	284,300	306,600	382,800	405,600	[illegible]	[illegible]
Cuba, Porto Rico, B. W. Indian ...	140,200	75,600	112,900	133,200	89,400	68,100	85,900	64,300	[illegible]	[illegible]
St. Domingo	314,600	437,500	508,800	305,000	516,300	476,700	414,000	406,500	[illegible]	[illegible]
Java	1,117,100	1,242,900	1,076,600	1,304,000	914,700	1,306,700	1,452,500	1,130,300	1,056,400	1,307,000
Padang	203,900	179,500	155,200	193,200	185,000	175,800	136,100	227,900	303,900	[illegible]
Mocado	16,200	15,400	8,400	13,400	20,700	27,900	26,300	13,900	18,100	[illegible]
Mocpanar...	9,700	28,900	18,500	19,600	15,600	36,400	29,100	37,000	19,000	40,900
Ceylon	583,900	566,100	783,300	625,600	876,000	848,500	837,600	903,400	1,000,000	1,418,300
B. E. Indian and Manilla ...	179,100	146,000	140,700	208,600	220,000	216,200	205,400	214,900	224,900	280,100
	6,919,500	6,368,900	5,896,900	5,417,500	6,320,600	6,320,900	7,365,600	8,007,500	8,048,400	7,776,300

DESTRUCTION OF COFFEE ESTATES BY RATS.

To the Editor of the Ceylon Observer.

SIR,—If you were the owner of a few coffee estates in certain districts, you would be surprised to learn the damage that rats at certain times of every year do on a coffee estate. I have noticed that it is one month now since they commenced the mischief they are doing at the present time. I can hardly describe it, but you can imagine from a half to a couple acres of fine coffee, generally on the sheltered parts of an estate, say bordering some jungle or near about a shady hill or rock, looking as green, soft or healthy and flourishing as one could wish, having all the young wood on it broken off. Almost every other tree is thus served, and the sight is pitiable; this young wood is the very thing we look forward to as the branches that are to bear and support next year's crop. Your planting readers, who have at some time or another resided on an estate above 3,000 feet or so, must have seen and experienced this. What would be the best plan to prevent this evil in the most practicable way is still a mystery. I have known a planter or two who would at these times employ from half-dozen to more coolies a day. Their work was after 5 or so in the evenings, to set about 3 dozen rat-traps (gins) with a piece of burnt dry fish or burnt cocoanut kernel, as bait, on the coffee trees, and fasten them to the tree with a piece of string. Six coolies will sometimes catch from 4 to 5 dozen rats of a night. They may be paid at the rate of 1d. or so each, as that would be the best plan of having a check on what they do. Can a better way than this be discovered of destroying these vermin? Some estates suffer with bug, for which there is no remedy or cure; fancy rats, bugs, a cold climate, and unfavourable weather combined. Pray invite some discussion in your columns about the first of these, and the best way to get rid of them. Coolies will readily consent to trap them for you in places where they are really numerous for ½d. each; they will bring you their tails, keeping the rest for their curry, which many of them consider a delicacy.

What should be done on high places when the thick part of your primaries, say about a foot from the stems, get covered with a thick coating of moss? It is rather expensive work clearing trees of them. A good pulian, with the aid of an old pruning knife (using the back of it), will barely do 60 trees a day. I consider the stem of a coffee tree, covered with moss, very injurious to it, for when the thick part of a primary is covered, young shoots cannot possibly force their way through it. Wet weather, I find, is the best time to employ women and boys at this work, half-a-dozen of them with an intelligent cangany to look after them will do much good in a day.

Yours faithfully,

22nd June 1871. WIDE AWAKE.

THE MARKETS.

INDIGO. There is but little of interest to add to our last advices. We regret that we cannot report any improvement in *Kishnaghur* and *Jessore*; some factories have already nearly closed with wretched out-turns, and it is doubtful whether the total quantity from these districts will reach the half of that of last year; the season is also rapidly drawing to a close in *Malda*, *Moorshedabad*, *Bhagulpore*, and *Purneah*, and although adverse weather and pressure from the rivers have caused them to make much less than the opening of the season led them to expect, these Zillahs will make considerably more than they did last season, and the increase will rather more than counter-balance the falling off in *Eastern Bengal*, *Kishnaghur*, and *Jessore*. *Midnapore*, *Rajshaye*, *Burdwan*, and *Mangbyr* together will probably send down about the same quantity as last year, so that, on the whole, we may expect the total yield from *Lower Bengal* to be about the same as that of last season.

From *Tirhoot* and *Chuprah* our accounts vary: in some places the weather has cleared up, and the yield from the plant improved in consequence, but in others the same unfavourable weather has continued, and where this is the case, the plant is giving poor produce in the vats, and the appearance of the *Kowtie* is much less favourable. *Champaran* is still doing well, and the first cuttings are now nearly all worked off.

In the *Benares Province* and the *Doab* there was a change for the better in the weather, towards the end of last month, but our latest accounts are to the effect that heavy rain had again set in. With a fine August they may still do fairly. We fear, however, that much of the late sown plant is injured beyond recovery, and there is no chance of the fine prospects with which the season opened being realised.—*William Moran & Co.'s Circular.*

INDIAN TEA.—Four public sales have occurred during the week, at which 4,204 chests were offered. Of this quantity 1,634 chests were sold at auction, 200 chests were disposed of privately, and the remainder were withdrawn either for higher limits or on account of not having arrived in time for auction. Prices at the commencement of the week showed symptoms of becoming weaker, but at the concluding sales, former rates were well maintained. The demand still continues good for all descriptions, strong teas commanding a brisk competition. The market at home remains very dull. Private contracts include 60 chests "Dulcimore" at 17 annas, 118 half chests "Nazeem" at 16 annas, and 60 chests "Kailut" at 12 annas. Further sales are advertised to take place during the ensuing week.—*Tudlow & Co., 5th August.*

AGRICULTURAL STATISTICS—1870.

No. 2.—TOTAL ACREAGE AND PERCENTAGE PROPORTIONS OF EACH KIND OF CORN AND GREEN CROP IN EACH DIVISION OF THE UNITED KINGDOM.

Description of Crops.	Years.	England. Acres.	England. Percentage proportions of each kind of Corn and Green Crop.	Wales. Acres.	Wales. Percentage proportions of each kind of Corn and Green Crop.	Scotland. Acres.	Scotland. Percentage proportions of each kind of Corn and Green Crop.	Total for Great Britain. Acres.	Total for Great Britain. Percentage proportions of each kind of Corn and Green Crop.	Ireland. Acres.	Ireland. Percentage proportions of each kind of Corn and Green Crop.	Isle of Man. Acres.	Isle of Man. Percentage proportions of each kind of Corn and Green Crop.	Channel Islands. Jersey. Acres.	Channel Islands. Jersey. Percentage proportions of each kind of Corn and Green Crop.	Channel Islands. Guernsey, &c. Acres.	Channel Islands. Guernsey, &c. Percentage proportions of each kind of Corn and Green Crop.	Total for United Kingdom. Acres.	Total for United Kingdom. Percentage proportions of each kind of Corn and Green Crop.
Corn Crops:—																			
Wheat	1869	3,417,064	43·9	135,562	24·4	135,741	9·6	3,688,357	37·8	281,117	12·7	8,748	30·6	2,798	82·0	969	46·2	[illegible]	[illegible]
	1870	3,247,973	42·9	126,928	22·9	125,642	8·8	3,500,543	36·7	260,914	12·0	8,256	29·3	3,052	82·6	898	42·9	[illegible]	[illegible]
Barley or Bere	1869	1,864,068	24·0	157,582	28·4	229,810	16·2	2,251,480	23·1	223,338	10·1	7,698	26·9	198	5·8	599	28·7	[illegible]	[illegible]
	1870	1,963,744	25·9	163,853	29·6	244,142	17·1	2,371,789	24·8	243,435	11·2	7,856	27·8	189	6·1	533	28·6	[illegible]	[illegible]
Oat	1869	1,511,975	19·4	252,970	45·5	1,017,775	71·8	2,782,720	28·5	1,684,788	76·3	11,823	41·3	361	10·6	438	20·6	[illegible]	[illegible]
	1870	1,490,647	19·7	253,057	45·7	1,019,596	71·6	2,763,300	28·9	1,648,764	75·9	11,638	41·2	393	10·6	441	20·2	[illegible]	[illegible]
Rye	1869	52,709	·7	2,610	·5	8,780	·6	64,099	·6	8,770	·4	49	·2	31		37		[illegible]	[illegible]
	1870	52,652	·7	2,009	·4	10,305	·7	65,166	·7	9,281	·4	27	·1	33		21		[illegible]	[illegible]
Beans	1869	548,257	7·0	3,944	·7	23,003	1·6	575,204	5·9	8,833	·4	130	·5	11	1·8	78	6·1	[illegible]	[illegible]
	1870	503,520	6·7	4,482	·8	22,093	1·6	530,095	5·6	9,644	·4	145	·5	10	1·7	74	5·8	[illegible]	[illegible]
Peas	1869	390,950	5·0	3,160	·5	2,067	·2	396,177	4·1	1,124	·1	153	·5	12		17		[illegible]	[illegible]
	1870	311,543	4·1	3,172	·6	2,483	·2	317,198	3·3	1,071	·1	300	1·1	18		20		318,007	2·7
Total of Corn Crops	1869	7,785,033	100·0	555,828	100·0	1,417,176	100·0	9,758,037	100·0	2,207,970	100·0	28,595	100·0	3,411	100·0	2,098	100·0	12,000,111	100·0
	1870	7,570,279	100·0	553,501	100·0	1,424,261	100·0	9,548,041	100·0	2,173,109	100·0	28,222	100·0	3,694	100·0	1,987	100·0	11,756,053	100·0
Green Crops:—																			
Potatoes	1869	356,829	12·9	49,107	38·5	179,275	26·0	585,211	16·4	1,041,837	70·9	4,396	35·4	2,736	46·9	1,167	[illegible]	[illegible]	[illegible]
	1870	358,890	13·0	48,602	37·3	180,169	25·9	587,661	16·4	1,043,798	69·6	4,197	33·1	2,702	47·0	948	[illegible]	[illegible]	[illegible]
Turnips and Swedes	1869	1,614,580	58·5	67,098	52·6	489,848	71·2	2,171,526	60·7	321,860	21·9	7,499	60·4	1,489	25·5	118	[illegible]	[illegible]	[illegible]
	1870	1,641,686	59·5	70,903	54·0	498,932	71·6	2,210,911	61·6	339,059	22·6	7,994	63·0	1,540	26·6	135	[illegible]	[illegible]	[illegible]
Mangolds	1869	297,182	10·4	4,528	3·6	1,032	·2	292,742	*8·2	21,029	1·4	37	·5	457	7·8	135	[illegible]	[illegible]	[illegible]
	1870	299,920	10·9	5,434	4·2	1,177	·2	306,531	8·6	25,220	1·7	71	·6	442	7·7	[illegible]	[illegible]	[illegible]	[illegible]
Carrots	1869	13,033	·5	324	·3	987	·1	14,344	·4	3,702	·3	231	2·7	257	4·4	197	[illegible]	[illegible]	[illegible]
	1870	13,832	·5	351	·3	1,076	·2	15,259	·4	3,940	·3	334	2·6	325	5·9	197	[illegible]	[illegible]	[illegible]
Cabbages, Kohl, Rabi, and Rape	1869	141,156	5·1	795	·6	3,300	·5	*145,251	4·1	42,237	2·9	21	·2	36	·6	132	[illegible]	[illegible]	[illegible]
	1870	140,074	5·1	699	·5	3,157	·4	*143,930	4·0	45,266	3·0	15	·1	40	·7	22	[illegible]	[illegible]	[illegible]
Vetches, Lucerne, and any other green crop, except Clover and Grass	1869	346,318	12·6	5,600	4·4	14,075	2·0	†365,993	10·2	38,210	2·6	102	·8	861	14·8	[illegible]	[illegible]	[illegible]	[illegible]
	1870	305,424	11·0	4,824	3·7	12,190	1·7	†322,438	9·0	41,446	2·8	77	·4	800	13·9	[illegible]	[illegible]	[illegible]	[illegible]
Total of Green Crops	1869	2,759,098	100·0	127,452	100·0	688,517	100·0	3,575,067	100·0	1,468,895	100·0	12,406	100·0	5,836	100·0	[illegible]	100·0	[illegible]	[illegible]
	1870	2,759,826	100·0	130,203	100·0	696,701	100·0	3,586,730	100·0	1,498,719	100·0	12,688	100·0	5,749	100·0	[illegible]	100·0	[illegible]	[illegible]

* Acreage under—	Cabbages.	Kohl, Rabi.	Rape.
1869	24,931	17,318	103,002
1870	20,919	23,959	99,052

† Acreage under—	Vetches or Tares.	Beetroot.	Chicory.	Lucerne.	Other Green Crops.
1869	204,094	3,168	684	[illegible]	[illegible]
1870	252,630	4,832	759	10,[illegible]	[illegible]

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India.

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

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Agricultural Gazette of India.

CONTENTS.

LETTERS TO THE EDITOR.

CULTIVATION OF RICE IN AMERICA

To the Editor of the

Agricultural Gazette of India

SIR,—In preparing the land for rice in America the ground is leared, embanked and ditched in a thorough manner, and is laid out into independent fields, so that a certain number of hands can complete any one operation connected with the culture of the rice in a single day The ditches vary in size, from five feet wide to fourteen feet, and from four feet to six feet deep, in the larger ditches they use flat boats to take their crop to the rick or stacking yard

The land is ploughed or dug over with the hoe early in the winter and is kept under water during the changes of the weather in March the ground is left to dry and made ready for the seed, trenches for the same are run at right angles with the drains, from thirteen to sixteen inches apart, with a four-inch trench hoe, from April to the middle of May, the seed is scattered in these trenches, at the rate of two or two and a quarter bushels to the acre, the seed is mixed with clayey water for one day before sowing, and then the water is let on the land until the seed sprouts, and then let off for ten days, and when the plants are about five weeks old the first hoeing takes place The plants are again hoed in ten or twelve days, and then the "long water" is put on for two weeks at first deep for six days, afterwards gradually diminishing the depth of water two more hoeings the joint appears on the plant, and the joint water is let on to remain a few days before the grain is ready to be cut The average yield on the low land is about forty-bushels, forty five pounds to the bushel, or about seventeen hundred pounds to the acre, the stalks grow in Carolina from five to six feet high.

W W AXELL.

Bassein, August 10, 1871.

HIMALAYAN ENTERPRISE

TEA CULTIVATION—No. III.

To the Editor of the

Agricultural Gazette of India.

SIR,—In my two preceding articles on the above subject, I have feebly endeavoured to pourtray the causes of the non-success which has till very lately attended the efforts of the European settler in the Himalayas.

This said non-success has not, it may be noted, been peculiar to the North-West Provinces and the Punjab, but has accompanied the introduction of tea in Assam and Darjeeling, likewise of the coffee plant in the Southern Provinces and Ceylon

In fact, the introduction of new staples may be said to resemble the storming of a breach; those who "lead the assault" are for the most part killed or badly wounded, those who follow either, rush over the bodies of their leaders and gain the summit, and the reward and glory; or if faint hearted, get frightened at the difficulties and dangers, and retreat, swearing that the breach is impracticable, and impracticable it sometimes is, at any rate pro tem either from the means at the disposal of the besiegers being inadequate, or from their wasting their resources in futile ill-directed efforts, or from their commanders being either corrupt or unequal to the occasion Should, however, the individuals composing the attacking force possess perseverance and courage, they may eventually overcome all these obstacles and effect a triumphant, if tardy, entrance into the citadel

Carrying on my simile a little further I will endeavour to show that if we have not as yet in the North West Provinces and the Punjab effected our triumphant entry, in other words made big growing a *fait accompli* by ensuring a steady profitable return, we have at any rate effected a strong lodgment from which we have every prospect of (as has already happened in Assam and Darjeeling after years of similar discomfiture) eventually making ourselves master of the enemy's works We have had to struggle with many obstacles with defective information certainly and perhaps in some places and in some instances, with official ill will and obstructiveness these were results of our own and these are now things of the past

But what has been our own fault and which, in India at any rate, is such a widespread and prevailing fault, in all cases of new enterprise, that it may almost be called a *sine qua non* shortcoming was *that we all began too much in a hurry* This "making haste to be rich" very nearly ruined the whole enterprise, and did ruin, or the next thing to it sundry individuals connected therewith

It was due no doubt in very great measure as aforesaid, to the utterly defective nature of the information as to tea growing supplied by the Government authorities, who laid down as a *sine qua non* that the smallest area which could profitably be cultivated, should not be less than 500 acres, and said not a word about either pruning or manuring, *both* of which operations have since turned out to be indispensably necessary

Still we were too much in a hurry, we should have tried a few experiments on an acre or two of land first ourselves and not taken the Government information quite so much for granted

Had we done so had we not forgotten the indispensable grain of salt we should have saved ourselves much disappointment and much loss of coin

In fact we *experimented with an entire capital* in most instances, instead of with only a small portion of the same consequently, though we are now tolerably well "posted up" we have bought our experience at a dear rate There is, however, according to the proverb little use in crying over spilt milk I will therefore endeavour, having traced out the principal causes of 'why we did *not* do it, to point out 'how it is to be done"

The steady light of the 'Lantern of Experience' having now for some years been turned on to the "path of industry and perseverance," has shown with exceeding distinctness one thing, which may be regarded as the grand axis or axiom on which the tea cultivation of the future will turn and be based, this is that tea planting, *without* high cultivation, will not only not pay, but will *invariably be a loss* while, *with* high cultivation, it will given well chosen localities and proper agricultural knowledge not only *pay*, but *pay well*

One acre of average good land *highly* cultivated will yield at the end of four years from time of planting 500 lbs per acre

One acre of the same land *unmanured* will average a yield of 70 lbs or at the very utmost 100 lbs Manure, in fact, is just as necessary to secure a profitable return from tea, as it is to secure a return from a market garden The first thing, or things rather, which a planter should organise, the moment he has secured his grant of land are his manure pits.

He should purchase at least 50 head of cattle (I am supposing that he contemplates putting 100 acres under tea), erect temporary sheds and huts for them, lay in grass for the purpose of stall feeding them during the winter, building a small godown or granary; for this purpose the first thing he should raise a substantial row of bamboo or cattle stalls, with drain running into the manure pits.

He can either make a couple of small rooms at one end of the bamboo a lodging for himself (which can afterwards be turned into godowns or outhouses for hardware,, or he can build a solid shanty with fire place

Dead fallen leaves from the forest patches, or jutans, as I believe they are called in Ceylon, oak leaves, grass, fern, &c, should be littered down every night under the cattle, and the whole mass cleared out once a week and thrown into the manure pits, the planter carefully super

intending all these operations himself, in fact, he should for the time being, turn cattle-breeding grazier.

We will suppose that the planter arrives in the [illegible] and expends four or five months in procuring and [illegible] a grant of say, 300 acres of land [illegible] bring him to the following spring, by which time he should have secured his grant, bought his cattle, and erected his temporary sheds and shanties.

After collecting manure throughout the spring and rains, he should, in the ensuing September, select a couple of acres of the best land (near the cattle sheds) for the construction of a seedling bed, or nursery; and having carefully terraced the same, taken out all weeds, grass, roots, and stones, and purchased 100 maunds of tea-seed, should sow the same in drills one foot or 18 inches apart, and 2 inches below the surface, the ground having of course been previously well manured.

This operation completed the nursery should be strongly fenced in, and the planter should resume his cattle-feeding, and manure-collecting.

By the commencement of the winter, say in December, the byres, permanent cattle stalls, and the planter's lodging, should be finished.

He can employ himself during the cold weather in making roads and paths about the grant, in addition to superintending his live stock.

He will probably lose during the first year, eight or ten of his original stock by disease, wild beasts, &c., but in return most of his cows will have calved, so that he will have at least half as many head again as at first.

However, before going any further, it may be as well to make a rough estimate of expenses up to date:—

	Rs.	a.	p.
Purchase of 300 acres, at Rs. 3-8 (per acre)	780	0	0
Do. 50 head of cattle (Rs. 9 per head)	450	0	0
Pay of these headmen, 12 months, at Rs. 8 per measem	187	0	0
Purchase of 300 maunds grain	700	0	0
Carriage of ditto to plantation	12	8	0
Cutting and storing grass for winter	150	0	0
Now of stone built and slated cattle houses to contain 100 head	2,000	0	0
Construction of 2 manure pits, 15 by 30, at Rs. 10 each	20	0	0
Terracing land for nursery and finishing ditto, 2 acres	100	0	0
100 maunds tea seed, at Rs. 5 per maund	500	0	0
Carriage of ditto to plantation	75	0	0
Laying out of roads in plantation, at 20 Rs. per mile (5 miles)	100	0	0
Add expenses, rope, cordage, baskets, sacks, &c., &c., &c	200	0	0
Cost of living for 12 months say Rs. 100 per month	1,200	0	0
Grand total	Rs. 7,725	0	0

Or say in round numbers .. Rs. 8,000

I must stop here for to-day.

L.

(To be continued.)

EDITORIAL NOTES.

THE Ipecacuanha plants which the Secretary of State for India is sending out, are, it appears, to be sent to the Superintendent of the Botanical Gardens at Calcutta, and are to be planted in the Sikkim Terai. They are from the Royal Botanical Gardens at Edinburgh, and are coming out under the care of Mr. W. Walton of the cotton department of Bombay.

A CORRESPONDENT writes to a home journal on the use of *salt* as manure:—"When I was in Australia, I noticed that the tracks made by the drays loaded with salt hides were always green, even in these driest times of the long 'buckfielders,' or hot winds charged with dust that destroy everything they pass over. This led me to think that here was a solution of the question as to the best dressing for grass lands, and it was here that I found it. For twelve seasons I have seen it tried upon a variety of lands and grasses, and always with the same results. In the spring, the refuse salt and sweepings from the ships and wharves, where wet-salted hides have been stowed, is spread over the sward; the young spring cattle are fond of it, and eat it evenly, and the fields so dressed keep green, when all around is parched and dry. From the absorbent qualities of the salt, moisture is attached and retained."

OFFICERS of the Controlling Establishment of the Forest Department will in future be allowed the same remuneration for passing in the languages, as is granted to civil members of the Engineer Establishment of the Public Works Department.

The following are the rates of remuneration:—

Rupees 180 for passing, within two years of joining the department, by the lower standard, in any language.

Rupees 180 for afterwards, and within five years of joining the department, passing by the higher standard in Hindoostani: or,

Rupees 360 for passing, within five years of joining the department, by the higher standard, in Hindoostani.

Rupees 500 for passing in examination in a language other than Hindoostani or [illegible] Hindoostani.

We invite the attention of wool-growers to the following extract from Messrs. Willans, Overbury & Co's circular, received by last English mail:—"The system of hot-water washing which has been so extensively adopted in almost all the Australian Colonies, is bringing many well-known and favourite flocks into disfavour with buyers. The heat of the water opens the staple of all but the finest portion of the fleece, and imparts to the wool a hardness of touch and wiriness of fibre to which manufacturers strongly object. It therefore becomes a question for the consideration of growers, how far it is for their interest to continue a practice which not only fails to improve the appearance of their wool, or to enhance its value, but must, at the same time, seriously diminish the weight of each fleece."—*Pastoral Times.*

MR. BROUGHTON, the Quinologist to the Madras Government, in a letter dated 14th July 1871, says:—I have the honour to state the results of the analysis of two specimens of red bark from Mahableshwar, in order that they may be communicated to the Government of Bombay.

"The specimens of bark differed in appearance from most of the India grown bark of *C. Succirubra*, by having a thicker, corky envelope which had partially scaled off its surface in many places, and thus altering its aspect.

"This was more especially the case with the older bark. The analyses are given in percentages of dry bark:—

No. I.—*C. Succirubra* bark, four years old.—

	Per cent.
Total Alkaloids	4·95
Quinine	1·46
Quinidine and other alkaloids	3·49
Sulphate of quinine obtained crystallised	0·75
" quinidine and cinchonidine	3·16

No. II.—*C. Succirubra* bark three years old.—

Total Alkaloids	5·34
Quinine	0·67
Quinidine and other alkaloids	4·57
Sulphate of quinine obtained crystallised	0·39
" quinidine and cinchonidine	2·48

"Hence, in gross yield of alkaloid, these barks are of good quality, the older being of course the better. They bear all the marks of being grown at a lower elevation than those of the Nilgiri plantations.

"It will be observed that they contain little quinine. The most remarkable quality of the barks is, that they contain but little cinchonidine, compared to the usual yield of red barks, that alkaloid being nearly entirely replaced by quinidine, an alkaloid of somewhat greater value, and not hitherto found in any large quantity in Indian barks.

"Hence, after the quinine is removed, a solution of the sulphates rotates the plane of polarization of a polarised beam to the right. The occurrence of this alkaloid is a circumstance of much interest. Cinchonine is also present, and is excluded from the above statement of crystalline sulphates."

PRESENT value of agricultural produce in Madras district.

From a recent contract made in Madras by the Commissariat authorities, we extract the following:—

	Rs.	a.	p.	
Butter, Cow, 1st sort	0	14	0	per pound.
Beef, 1st sort	0	3	6	" "
Chickens	0	3	0	each.
Fowls	0	2	6	"
Eggs	0	0	1	"
Mutton, 1st sort	0	3	6	per pound.
Milk, Cow, 1st sort	0	1	11½	per pint.
Onions	0	0	6	per pound.
Potatoes	0	0	10½	" "
Pepper, black	0	1	10	" "
Rice	0	0	7½	" "

Dairy produce is exceptionally high, though perhaps not high for the district, still, if English farmers are content to sell butter at 18 pence per pound, and milk at 2 pence per

[illegible]

[illegible] cost in Madras and [illegible] charges are [illegible] per pound in [illegible] [illegible] in Madras and [illegible] purchased at [illegible] per pound. The English feeder has to pay [illegible] per ton, [illegible] that the Madras farmer [illegible] at [illegible] a ton, and manure, which can be [illegible] in Madras at [illegible] a ton, is cheap in England, when it can be bought at [illegible] a ton. While other feeding material show a similar [illegible] in favour of the Madras feeder. But it is hopeless to expect cheap meat and dairy produce, until we have improved breed of cattle and sheep. Good food is lost upon the wretched stock of the Indian farmer. Until we have better sheep and cattle, the consumers of mutton and dairy produce must be content to pay at least 50 per cent. higher than would suffice to satisfy the demand of the farmer, under an improved system of agriculture.

THE *Canada Farmer* has the following important remarks on "the selection and change of seed":—

"This is a matter of primary importance to the farmer, for however well he may manure and cultivate his land, his labour will be but thrown away if he neglects to obtain clean and sound seed of the most approved varieties of whatever crop he intends to grow. It is the opinion of many practical men that the crops of most kinds of grain will deteriorate when confined to selection of seed grown on the same farm, or even the same region of country, for many years in succession. Others maintain that by always selecting the best seed from the crops grown on the farm, and taking particular care to have only such as is plump and well matured, the quality will improve from year to year. We think there is truth on both sides. We have known a farmer to sell off the best of his grain and reserve that of inferior quality for seed, remarking that, small as it was it would grow, and that he thought was all that was necessary. Such an idea is a common but erroneous one; as although a plant will be produced from inferior seed, it will be wanting in the healthful vigour, that is, the characteristic of one grown from a plump and well developed seed, which contains not only a large and strong germ, but also a full amount of the plant food requisite to support that germ until the young rootlets can eliminate food from the soil for the support of the plant.

"It is the want of a proper appreciation of this fact that leads many to imagine that a change of seed, even between near neighbours, is of great value. Thus, a farmer who does not take the trouble to select his seed wheat from the best portion of his crop when growing, and to separate and reserve it for future use, or who never frees his seed from the presence of cheat, cockle, or other noxious weeds before sowing, finds a great advantage in obtaining seed of the same variety from a neighbour who has the reputation of growing good crops, and who has a nice, plump, clean sample of seed grain for sale. In such a case, the advantage gained is ascribed to change, when in reality it is due to selection. But, on the other hand, varieties of grain, grasses, &c., have originated or become common in one part of the country, and their introduction to another portion of the same, or an adjoining country, proves of signal advantage to the cultivator of the soil, for a time at least. A farmer who takes an agricultural journal often reads in it an account of some new variety of grain as yet unknown, except in some distant locality. He sends for a small sample (perhaps a few bushels), sows it, and soon discovers that it possesses some quality that gives it superior advantages over the varieties that have usually been grown in his neighbourhood. His neighbours find out this fact, and then come a-ask to him with "please let me have some seed of that new kind of wheat you grew last year". It is just here that we find the benefit of change, which is the discarding of one variety

[illegible] cultivation [illegible] may be [illegible] [illegible] enterprise [illegible] supply, by [illegible] a higher price for the seed he grows than the ordinary price of the commonly grown seed of the same variety."

THE latest agricultural returns from home show that the total acreage returned for the United Kingdom as under all kinds of crops, bare fallow, and grass in 1870 was 44,177,870 acres, against 46,100,188 in 1869. Of the total acreage in 1870, Great Britain had 29,407,679 acres, Ireland 14,619,278 acres, and the Islands 117,313 acres. In Great Britain the land was divided between tillage and permanent pasture in the proportion of 16,834,798 acres, or 60 per cent., for tillage, and 12,572,881 acres, or 40 per cent., for permanent pasture; in Ireland, 5,661,510 acres, or 36 per cent., were under tillage, and 9,960,968 acres, or 64 per cent. were under permanent pasture; and in the Islands 95,742 acres, or 81 per cent., were under tillage, and 21,471 acres, or 19 per cent., under permanent pasture. In 1870 the United Kingdom had a total acreage under corn crops (including beans and peas) of 11,755,053 acres, of which 9,548,041 acres were in Great Britain, 2,173,109 in Ireland, and 33,903 in the Islands. Under green crops (including potatoes) the total acreage for the United Kingdom was 5,107,135 acres, of which 3,586,730 were in Great Britain, 1,490,719 in Ireland, and 31,686 in the Islands. Under bare fallow the total acreage for the United Kingdom was 630,294 acres, of which 610,517 acres were in Great Britain, 19,054 acres in Ireland, 723 acres in the Islands. Under clover and other kinds of seed grasses under rotation, the total acreage for the United Kingdom was returned at 6,330,136 acres, of which 4,504,684 acres were returned for Great Britain, 1,775,635 for Ireland, and 39,407 acres in the Islands. The acreage under permanent pasture in 1870 in each division of the United Kingdom has already been stated comparatively with the total acreage under tillage. Of the 11,755,053 acres under corn crops in 1870 in the United Kingdom, 3,773,663 were under wheat, 2,622,752 under barley, 4,424,536 under oats, 74,527 under rye 589,968 under beans, and 318,607 under peas. Comparing the corn crops of Great Britain and Ireland, it appears that of wheat Great Britain, inclusive of the Islands, had 3,512,749 and Ireland 260,914 acres; of barley, Great Britain had 2,371,729 and Ireland 243,435 acres; of oats, Great Britain had 2,763,200 and Ireland 1,648,764 acres; of rye, Great Britain had 65,166 and Ireland 9,281 acres; of beans, Great Britain had 550,095 and Ireland only 9,644, acres; of peas, Great Britain had 317,196 and Ireland not more than 1,071 acres. The green crops, including potatoes, occupied a total acreage in the United Kingdom of 5,107,135 acres in 1870. Potatoes were grown to the extent of 1,639,296 acres, turnips to the extent of 2,559,829 acres, mangolds to the extent of 332,409 acres, carrots to the extent of 10,925 acres, cabbages, kohl-rabi, and rape to the extent of 189,344 acres; and vetches, lucerne, and other green crops, except clover or grass, to the extent of 366,532 acres.

MR. Horace Greeley, Editor of the *New York Tribune*, is responsible for the following "advice to small farmers":—

"Whoever finds himself the newly-installed owner and occupant of a farm, should, before doing much beyond growing a crop in the ordinary way, study well its character, determine its capacities, make himself well acquainted with its peculiarities of soil and surface, with intent to make the most of it in his future operations. I would devote at least a year to this thoughtful observation and study.

"We will suppose this farm to measure from 50 to 150 acres. Now the young man who has bought or inherited this farm, may be wholly and consciously unable to enter upon any expensive system of improvement for the next ten years, may fully realize that four or five days of each week must sometimes be given to the growing or earning of present bread, yet he should none the less study well the capacities and adaptations

of each acre, and mature a comprehensive plan for the ultimate bringing of each portion into the best and most useful condition whereof it is susceptible, before he cuts a living tree or digs a solitary drain. He is morally certain of doing something, perhaps many things that he will sadly wish undone, if he fails to study peculiarities and mature a plan before he begins to improve or to fit his several fields for profitable cultivation. And the first selection to be made is that of what I will call a "pasture," since I am compelled to use an old familiar name for what should be essentially a new thing. This "pasture" should be as near the centre of the yard as may be, and convenient to the barn and barn yard that are to be. It should have some shade, but no very young trees; should be dry and rolling, with an abundance of the purest water. The smaller this pasture lot may be, the better I shall like it, provided you fence it very stoutly, connect it with the barn-yard by a lane, if they are in close proximity, and firmly resolve that outside of this lot, this lane, this yard, and the adjacent stable, your cattle shall never be seen, unless on the road to market. Very possibly the day may come wherein you will decide to dispense with pasturing altogether, but that is for the present improbable. One pasture you will have: but permitting your stock to ramble in spring and fall all over your own fields, and perhaps your neighbour's also, in quest of their needful food, biting off the tops of the finer young trees, trampling down or breaking down some that are older, rubbing the bark off your growing fruit-trees, and doing damage that years will be required to repair, I most vehemently protest against.

"The one great error that misleads and corrupts mankind is the presumption that something may be had for nothing. The average farmer imagines that whatever of flesh or of milk may accrue to him from the food his cattle obtains by browsing over his fields or through his woods, is so much clear gain that they do the needful work, while he pockets the net proceeds. But the universe was formed on a plan which requires so much for so much, and this law will not submit to defiance or evasion. Under the unnatural transitory conditions which environ the lone squatter on a vast prairie, something may be made by turning cattle loose and letting them shift for themselves; but this is at best transitory and at war with the exigencies of civilisation. Whoever lives within sight of a school-house, or within hearing of a church-bell, is under the dominion of a law alike inexorable and beneficient, the law that requires each to pay for all he gets, and reap only where he has sown.

"You can hardly have a pasture so small that it will not afford hospitality to weeds, and prove a source of multiform infestations. The plants that should flourish and be diffused will be kept down to earth: those which should be warred upon and eradicated will flourish untouched, ripen their seed, and diffuse it far and wide. Thistles and every plant that impedes tillage and diminishes crops are nourished and diffused by means of pastures.

"I hold, therefore, that the good farmer will run a mowing machine over his pasture twice each summer, or, if his lot be too rough for this, will have it clipped at least once with a scythe. Cutting all manner of worthless, if not noxious plants, in the blossom, will benefit the soil which their seedling would tax: it will render the eradication of weeds from your tillage a far easier task, and it will prevent your being a nuisance to your neighbours. I am confident that no one who has formed the habit of keeping down the weeds in his pasture will ever abandon it.

"I think each pasture should have a rude shade or other shelter whereto the cattle may resort in cases of storm or other inclemency. How much they shrink, as well as suffer from cold pelting rain, few fully realise: but I am sure "the merciful man" who (as the Scripture says) "is merciful to his beasts," will find his humanity a good paying investment. The rule would fail probably on great runs; but I am contemplating civilised husbandry, not the rude conditions of semi-barbarism. If only by means of stakes of straw, give cattle a chance to keep dry and warm, when they must otherwise shiver through a raining, windy day and night on the cold wet ground, and I am sure they will pay for it.

"In confining cattle to small pastures during the day, I do not intend that they should be starved to their grass there. On the contrary, I expect them to be fed in the yard, on green corn, sorghum, stalks, roots, &c., &c., as much shall be in season. With a good handy mower, it is a light hour's work before breakfast to cut and cart for a dozen or twenty head as much grass or corn as they will eat during the day."

From a translation from the *Echo Agricole*, we make the following opportune clipping concerning the preservation of grain. The article is from a volume on the "Preservation of Cereals," prepared by Dr. Louvel at the instigation of the Society of French agriculturists:—

"The preservation of wheat in pits, still practised in the present day, goes back to a very high antiquity, and Dr. Louvel has written at great length on the process. He has brought forward a work of Doyere, who it is well known has suggested a rational system of pitting grain: and after having done full justice to all his predecessors, he compels his readers to acknowledge the insufficiency of those processes, and the necessity of doing better than they. Thanks to the application of the vacuum; he has solved this problem in the most satisfactory manner, and he may say with Archimedes "I have found it!"

A sheet-iron cistern, occupying little space, and which will contain 100 hectolitres (upwards of 275 bushels), an air pump that may be worked either by hand or steam, and a manometer (pressure-gauge), to indicate the degree of vacuum, comprise the whole apparatus of preservation of Dr. Louvel, and of which he has made proofs. Our chief Editor, Mr. Victor Borie, has already, some years since, given an account of some very curious and conclusive experiments which had been made at Vincennes, and at which he was present as a member of the Committee of Examination, in company with Messrs. Boussingault, of the Institute; Senard, Physician-in-chief of the marine; Tissorand, chief of the division of the crown establishments; Doisneau, former syndic of the Paris bakery; and Lecouteux, member of the Imperial and Central Agricultural Society, and now chief Editor of the journal of Practical Agriculture.

After a detention of seven months, the wheat, the flour, and the biscuit enclosed in the apparatus of M. Louvel, were withdrawn in a state of perfect preservation. Bread has been made of that flour, and, having eaten of it, we can affirm that it was excellent; the cost price per year and per hectolitre, including interest on the apparatus and hand labour, was less than one franc (or £4 per 100 hect.): and it is certain that it will be still lower when the system is fully developed, and the manufacturer can purchase his materials at a better market.

The question is therefore settled. The following is the opinion of a competent judge amongst us, M. Tousillon, who thus expresses himself in the book that he has published after the Exhibition of 1867:—"Dr. Louvel has invented a means of preservation of (grain) which completes that of M. Doyere, and has none of the inconveniences that I have pointed out. His apparatus consists of a sheet-iron cylinder, supported by a tripod, either wrought or cast-iron, or wood painted or tarred. When the cylinder has received its charge (of wheat, flour, &c.), the vacuum is made, not complete, which would be useless, by a rarefaction of the air to a sufficient degree, indicated by the manometer fixed to the air-pump. Thus, the cylinders of M. Louvel are also as impermeable as the pits of M. Doyere, require no masonry, can be placed anywhere, the wheat, &c., is safe from fermentation, insects, and cryptogamic vegetations. One very important effect, and which results from the numerous and continuous experiments made as well by the honourable inventor as by a Committee appointed by the minister of the Emperor's house, is that the vacuum not only kills the parasitic insects and prevents fermentation, but it dries the grain at the same time.

"The hermetic apparatus of M. Louvel is calculated to render

[illegible]

[illegible] the cost of any building.

"M. Lecerf has [illegible] by the system; still [illegible] per hectolitre per year, [illegible] of the cylinder, a very trifling [illegible] of an ordinary granary room, which [illegible] of the shovelling, turning over, sacks, &c., more than 8 francs per hectolitre per year.

"I shall [illegible] upon the question of large reserves and ground depôts with warrants, which would only be possible upon Dr. Lecerf's system; but I am convinced that the farmers ought to adopt it if they wish to preserve their crops from the numerous causes of damage and destruction, and thus have a security which would allow them to borrow on their reserves." We have nothing to add to this estimation, which is complete, and is, we request, that of a disinterested and particularly competent man.

THE AGRICULTURE OF INDIA

THE GOVERNMENT FARM—MADRAS.

(From the Madras Times).

THE last report of the Government Farm at Sydapet is too bulky a document to reprint in the columns of a (daily) newspaper, else we should be tempted to favour our readers with it. It is a Model Report, owing its bulk to the many valuable subjects treated, and not to its diffuseness. It is, indeed, a model of laconic writing, for there is scarcely one chapter that occupies a whole page of ordinary official foolscap. We do not propose to undertake the task of condensing into a single column the contents of the forty-five pages of concentrated reading that forms the report, and will but refer to the one very important subject of fodder for horses and cattle. Mr. Robertson has given much attention to this matter, driven to it by the necessities of his own herd and flocks. The complaint has always been that India is very deficient in green crops suitable for the good of cattle, and that from June to October especially, there is nothing to be got but roots, unless the petty monsoon should, as in 1870, be heavy and continuous one. We must confess to having sympathized with this view of the case. But Mr. Robertson laughs at it, scorns it as absurd, and loudly asserts that we are extraordinarily well off. Let us quote his words: "Instead of there being a scarcity of fodder crops in this country, my experience has satisfied me that the Indian farmer is most bountifully supplied with these crops. Indeed in this respect he is much better off than our English farmers. The Indian farmer has a great diversity of fodder crops at his command. He has crops that will grow in the hot weather and in the cold weather, on clay and on sandy soils, under wet or under dry cultivation. In this country a couple of months will suffice to produce a crop that in England could only be produced in double the time. Besides, many of these Indian forage crops are very rich in saccharine matter.

This sounds strange until one reads its justification as given at the farm itself. The fact is Mr. Robertson treats as fodder many crops that have usually been cultivated only for seed. Take for instance the common yellow cholam. This is cultivated almost everywhere as a grain crop. But at the Government farm it is cut several times for fodder, and then allowed to go on to grain. The plant grows so rapidly that in sixty days after planting, the stems will be seven feet high, and about an inch and a half thick. This stem is perfectly succulent, and is eaten with avidity by cattle and sheep. There are crops now at the farm in all stages of growth, receiving no advantages beyond those that fall to an ordinary ryot's field. Some have been cut three or four times, and now grow almost as bushy as guinea grass. As much as 10,000 lbs. weight of green fodder may be taken off an acre of ground every three months. If the plot be irrigated, one-fourth more may be obtained, and the crop be cut every two months. That is, an acre of irrigated ground will produce about 70,000 lbs. weight of green and nourishing fodder in one year. The thing would be almost incredible, without the ocular evidence that may always be obtained at the farm.

The new Chinese sugar-cane, or sorghum saccharatum, is still more fruitful. Its returns border on the miraculous. Under dry cultivation, that is, with no other water than that furnished by the ordinary rainfall, an acre of ground will produce [illegible] weight within eighty days of the sowing of the seed. In America and China the plant is grown for the

[illegible] was divided into plots, some of which were manured, and others not. The total yield was 1,180 lbs. of grain, and [illegible] lbs. of straw. The grain was considerably more than one hundred-fold of the seed, and the straw was of almost equal value. Reducing the rates to an acre we find that in about 110 days an acre of ground will produce 1,700 lbs. of grain and [illegible] lbs. of straw. But many persons cannot afford the outlay for manure. We therefore give the returns on a very poor soil, altogether unmanured for the occasion, 1,182 lbs. of grain and 17,[illegible] lbs. of straw. This is sufficiently profitable, but Mr. Robertson finds that it is still more advantageous to cultivate the plant purely for green fodder.

These results will not, however, explain how green fodder can be produced, say, in September. For this we turn to another plant which hitherto has been grown only for its grain. We refer to the common country cumboo. This was sown in the middle of June, and received no water other than the ordinary rainfall. Within six weeks it reached an average height of not less than eight feet, and was then cut for green fodder. The cattle ate it greedily, and fattened much more rapidly than usual on other green crops.

The weight of the fodder reached the high figure of 15,000 lbs. per acre. It would be the easiest thing in the world so to arrange the planting of cumboo as to obtain a constant supply of fodder at all times. Well may Mr. Robertson say:—"We found the cumboo crop very valuable. It afforded us an abundant supply of green fodder at a time when, in this neighbourhood, it is usually very scarce. We can always manage to have something green for the stock between the months of October and May, but the great difficulty has hitherto been to find some crop that will yield green fodder during the months of June, July, and August. Of course under irrigation, it is possible to grow yellow cholum, so as to afford a supply of green fodder throughout the hot season, but there are large tracts of country to which irrigation cannot be applied in which cumboo will yield excellent green fodder during the season, when the stock feeder finds it the most difficult to maintain the condition of his animals. Many other plants come within Mr. Robertson's definition of green fodder. Horse grain is one that has produced admirable results, as it grows almost anywhere, requires minimum of care, and gives a good dry fodder for hay. Without other help than the ordinary rain, it will give 7,000 lbs. of green fodder per acre, a fodder which is very fattening, and well liked by cattle and sheep. If abundance of water be available there is nothing like Hurriali grass. The curious visitor who can find the Kistnamapett sewage farm, may see there an acre of land which produces not far short of 100,000 lbs. of green fodder in the twelve months. We were lately shown grass that had been cut only 30 days before, and yet when we saw it, stood ready for cutting again, in fact, was being cut. The superintendent assured us that "when a heavy shower fall, one could see the grass grow, but this required better eyes than ours. On one occasion when several advantageous circumstances met, the Hurriali grass at this place grew to the enormous height of eight feet. At the Peoples' Park, three crops of excellent grass are cut each year on areas that are not irrigated. There is a little plot of grass land in the compound of the house, now occupied by the Honorable V. Ramiengar, on the Pomamallee road, which produces a heavy crop of grass every five weeks, and is said to return its proprietor a profit of cent. per cent. upon his outlay for irrigation and manure. At Bangalore the grass, from decently large compounds, will pay two months' rent of the house; and with ordinary care, and some little outlay, an equal return may easily be obtained in Madras.

The general result of Mr. Robertson's experiments is that with care an abundance of green fodder may be maintained all the year round; that an acre of land thus laid out will amply keep two or three horses, and double that number of cattle; that with abundance of water, Hurriali grass is the most profitable crop; with a tolerable supply, sorghum saccharatum pays best; with water only from October to May, yellow cholum and cumboo will maintain an abundant and continuous supply of green and nutritious food.—

AGRICULTURE IN EUROPE

FLAX CROPS.

[Difficulties of Manipulating and of Marketing.]

Even where the process is most ruddy conducted, the cost of agricultural enterprise and labour, which we take to be proba-

seems as easily obtained by a flax crop as by any other. The preparation of both seed and fibre, or of either, if one be sacrificed to the other, has been and is every year successfully carried out on the worst cultivated farms, while the facilities for sale are as many and quite as accessible for flax-seed or flax-fibre, as for wheat, oats, barley, or hops. If the expense of rippling-combs be avoided, and the cost of rippling saved, the flax straw, in its green state, is got at once into the retting pits: when retted, it is grassed (or bleached), and if there be no scutch-mill near at hand, the fibre may be prepared for market by hand-scutching. These modes of dealing with seed and fibre are rapidly departing from the ordinary practice of flax growers. The advantages of leaving the bolls in the flax are, that no risk is run by unskilful rippling, and some say the fibre gains in quality, in consequence of the contribution, in the retting process, of the oil of the seed to that of the stalk in making the fibre "kindly;" but its disadvantages are the loss of the seed, and the danger of the stalk breaking of its own weight in handling, or of its being broken in the attempt to knock the bolls off. The chief disadvantages of hand-scutching are the slowness and the greater cost of the process. But suppose it possible for people to have nothing else to do in winter, hand-scutching may be applied instead of mill-scutching, to a flax crop, without greatly lessening the gross sum realized for the produce. It is, nevertheless, necessary for successful flax culture, that scutch-mills should be erected in sufficient numbers, and at convenient distances, so that each farmer may be able to get his crop scutched within four or five months, which seems to be the flax marketing season. The cost of erecting a scutch-mill is small, and the profits arising from scutching for hire liberal. But where farms are large, as in England and Scotland, each farmer might have a small mill of about three, six, or nine stocks, in either of which skilful scutching may be practised as well as in mills of the largest size. The quantity of flax scutched annually in Ireland, is, on the average of the past five years, between 40,000 and 50,000 tons. In 1865, the returns show 64,506; 1867, 39,561; 1868, 40,991; 1869, 35,670, and 1870, 36,615 tons; and this is done by about 16,000 mills, seven-eighths of which are in Ulster. At each of these mills, if necessary, a buyer would attend, but in a general way, farmers prefer selling their flax in the open market. But supposing flax growers in England and Scotland could find no market for their fibre in the locality, and that no one attended at the scutch mills to buy for the spinners, the cost of transit of the produce of an acre of flax from any corner of the United Kingdom, to Belfast, Dundee, Leeds, or to the particular mills direct, which its peculiar quality suited, *plus* agents' fees for selling, and all expenses, would be too small to be worthy of consideration, as an argument against growing it. No such difficulties, however, could possibly exist, for as soon as the farmers of Great Britain would grow flax, spinners would look after it. Besides, mills would be erected for spinning flax in all parts of the country, and several of the purposes now served by calico would be better served by linen. More enlightened modes of manipulating flax than any as yet used, might be adopted with great advantage to the farmer. We could not attempt in these columns to give a detailed description of any plan, though we had one ready; yet the largest share of our confidence is in those which at once separate certain processes now enacted, and join others usually separated. Another idea we have of reform in manipulating flax crops, though we cannot give even the outlines of a plan, is, that in proportion as it carries operations into the hands of manufacturers, immediately after the crop is grown, in that proportion is it commendable; strictly, the manufacturing of flax commences when it is pulled, and, therefore, if the farmer sold his crop green, and if a class of manipulators, undertaking retting, bleaching, and scutching, were called into existence, so much the better for both agriculturist and manufacturer. Dealers to buy flax "on the feet" seem "wanted," and though some persons in that line have not conducted their trading according to a high standard of mercantile ethics, yet the like has been said of people, and, it is to be feared, justly, in every other branch of business, and still no one supposes that the several callings created in the interests of a division of labour, are to be regretted; nor do we suppose dealing in green flax will be considered an exception. Besides this and like divisions of labour, there seems also a necessity for such combinations as would facilitate the utilization of both "shoves" and "steep water". We do not stake the argument in favor of extended flax culture, or any condition of reform in the mode of manipulation. Nor do we see any impracticability of such extension arising from a want of markets. Still more, we have only to look at matters as they are to be convinced that if scutching machines were wanted, as a consequence of flax extension, it would be supplied by the same manufacturers, who have not only met the necessity for improved ploughs and other implements, but have done much to accelerate reform by the introduction, unasked, of new and re-former implements of agricultural operations. Taking the case as it is, there is no insurmountable difficulty in the way of extending flax culture in England, Wales, and Scotland, up to the limits of a scientific rotation, except it be that where soft water is not accessible, retting is impossible. But if the waters of the rivers, and springs of certainty be hard, the gathering of the rainfall means, the same, and places, this objection alongside the other real or imaginary hindrances amongst the things that have been.

SEED SOWING.

(From the North British Agriculturist.)

As most people who wish to make the most of their gardens will be thinking about getting in crops in a general way now, if the soil is in a fit state to receive them, we propose giving a few hints on seed sowing, as to when and how to do it. As to when seeds should be sown is a point that must always be determined by the state of the soil with regard to wetness or dryness. Stated days and dates for putting this or that crop in the soil should be avoided. We have known people exceedingly exact and precise about this matter, who would sow their onions as near the first day of March as possible, and who were not a little disturbed if Sunday interfered therewith. Their successes were usually ascribed to their strict observance of sowing at a given time, and their failures could not of course be accounted for, but the probability was that the seed had been committed to a bad bed—in other words, the soil was wet and totally unfit to be worked. If the soil clings readily to the feet or tools in the working, it is not in proper condition, and it is better to wait a few days, or it may be a week or two with some crops at this early season, rather than risk failure and re-sowing when perhaps too late to have a tolerable chance of succeeding. The onion crop is one which it is generally well to get in early, but at the same time there is often too much importance attached to the early sowing of it. Good onions may be had sown so late as April, and even May; but we do not advise deferring so late as either of these months, if it can be done earlier. The fact is mentioned only with the view of showing that there is comparatively little importance within certain limits to be attached to sowing in spring at any set period, if the crop is a hardy one that may be grown without difficulty in our climate. Onions may be sown any time from the end of February till the middle of April, according as the soil is in such a state as to be worked with comfort, that is, when the necessary tools can be used without the inconvenience of the earth sticking to them to such an extent as to hamper the operator. This practical test should be applied in the case of all seeds. Some crops, however, such as peas, which require to be sown as nearly as possible in regular succession at intervals of from fourteen to twenty days, in order to keep up a close supply of the crop throughout the season, may be sown with less regard to the test above given. The operations connected with the sowing of peas are not so liable to spoil the mechanical condition of the soil, which is the principal evil to be guarded against in working it when wet for seed sowing, as that more complete pulverisation which is necessary to prepare it for smaller seeds. The greater bulk of the seed in the case of peas, and the hardy nature of both the seed and the seedling, render it perfectly safe to sow this crop often, when it would be very injudicious to sow more tender and smaller seeds, and generally we would advise that in gardens with only imperfect shelter, a few days delay is less to be feared than hasty action when the earth is wet.

The manner of sowing is of some importance both on the score of economy and success. The most common practice with small seeds, such as cabbage, greens, onions, and sometimes also with turnips, even in small gardens, is to sow broad-cast, especially when small beds are set apart for the reception of each crop. Now this practice, though very convenient, and in some cases attended with a slight saving of labour, is wasteful of seed, and not accompanied with the same amount of success as drill sowing. The difference of a pinch or two of seed may not have much weight with those perhaps whose requirements are met by the smallest quantity that may be procured of any given kind, and the point need not be pressed on the attention of such. But the other consideration of the relative chances of success is of equal importance to all, be the quantity of seed to be sown large or small. By drill sowing, seeds of all kinds come away more sturdily, a fact that is easily accounted for, and if the seedlings are to be transplanted as in the case of the cabbage tribe, leeks, &c., it admits of a more successful transfer of the plants from their seed bed to the permanent quarters. Drill sowing is also preferable to broad-cast, for those crops which are to come to maturity where they are sown, as onions, turnips, and the like. The work of cleaning is simplified and facilitated, whereby the hoe may be used instead of hand-weeding, and the stirring that may be practised between the drills is manifestly an advantage to all crops as an invigorating process, besides being an easy and expeditious way of keeping down weeds. It may appear to some, that in the case of such a crop as the onion, there would not be grown the same bulk or

which has grown upon the drill system as what it is grown [illegible] in fact obviously with more certainty when the crop is in drills with a proportionate yield of grain [illegible]. Right feeding between the drills would be a great [illegible] in small gardens; in larger ones, where economy of space is not a paramount consideration, ten inches is not too much. In heavy heavy soils, at least ample space should be left between the drills to admit of a free use of the hoe, as much ploughing is usually needed, and is very beneficial in such soils.

SCIENTIFIC AGRICULTURE.

[Read before the Maidstone Farmers' Club.]

(By John Bennet Lawes, Esq.)

Of course I may assume that your desire to discuss this subject, and my promise, here to introduce it, are due in great measure to what so many of the members of this club saw and heard on the occasion of a visit which I had the honour to receive from them, at Rothamsted, during the past summer. They then saw, as many others have seen, that a great deal of active investigation has been, and is still going on there in connection with agriculture; and I have little doubt they felt some disappointment, as I know others have done, at not being able to see very clearly the direct practical lessons to be learnt from the results of so much labour. If their thoughts were put into words they would probably say—"You have made very interesting experiments on various crops, both with ordinary and artificial manures; you have conducted numerous experiments on the feeding of stock, and you have a laboratory containing nearly 20,000 bottles; but we wish you to understand that we take no special interest in these things, excepting so far as they relate to our business. We are farmers; our capital is invested in the cultivation of the soil; and the welfare of ourselves and of our families depend upon the profits we can realise. We want to know—how, if you were a farmer, with no other source of income, you would use your knowledge to increase your profits? or rather—how, if in addition to our practical knowledge, we possessed all the information which you have acquired from your scientific experiments, should we alter our practice to increase our profits?" I take it that, in arranging for this evening's discussion, the Maidstone Farmers' Club hoped, by its means, to arrive at some solution of the above questions.

When we consider that the system of agriculture practised by the most intelligent farmers of any district, has been the result of long observation and experience, it must be admitted that any important changes suggested by science should, as far as possible, be based on a knowledge of the principles involved in the existing practices. For example, those who would propose to interfere with the ordinary course of rotation, by substituting a corn crop for a pulse or a roo crop, may reasonably be asked, not only—what description and amount of manure will be required to grow the corn crop? but also—what will be the relative state of fertility in which the land will be left when the one crop has been substituted for the other? Again, if it be proposed to use artificial manures, instead of producing ordinary manure by the feeding stock on cake or other purchased food, it is obviously desirable to possess accurate knowledge—not only as to the description and amount of artificial manure required to produce a given crop, but also as to the amount of meat, and the amount and composition of the manure, that will be yielded by the different descriptions of purchased food.

Now, I propose to show you, by one or two examples, how much labour, and how much money, the investigation of subjects having a direct bearing on the practice and profits of agriculture may require, before absolute certainty can be arrived at respecting them; and I could, without difficulty, occupy the whole of the time of this meeting in pointing out the various subjects which have been, and still require to be, investigated by men of science, before long established existing practices can be thoroughly explained.

I dare say most of you know that the atmosphere which we breathe is composed almost entirely of a mixture of nitrogen and oxygen. The nitrogen constitutes more than three-fourths of the whole by weight, and the quantity of it resting upon every acre of our fields, amounts to more than 32,000 tons. All the crops we grow contain nitrogen, some in larger and some in smaller quantity. Nitrogen is also, as you well know, a very active and a very expensive element in manures, costing when purchased in artificial manure not much less than 1s. per lb. Accurate knowledge in connection with this substance is therefore of the greatest possible interest to the farmer.

As all our crops are so dependent upon nitrogen in their food, and as they are surrounded by so large a store of it in the atmosphere throughout their growth, what could be more natural than to suppose that they obtain it from that source? What investigation could be more important than to determine whether they are able to do so or not? and, if they are, to settle to what extent they do so, or by which of them, or under what circumstances the largest quantity of it can be assimilated. In fact, one of the explanations which has been put forward of the benefits to be derived from a rotation of crops is that whilst some plants can absorb the nitrogen of the atmosphere, others cannot do so. Here, then, is a question for scientific investigation "with a view to profit;" and what do we find has been done to arrive at a solution of it?

Nearly a century ago, Priestley and Ingenhousz came to one conclusion on the subject from their experiments, and Saussure and Woodhouse, to an opposite one from theirs. About the end of the last century and the beginning of the present one, Boussingault took up the question, and, a little more than thirty years ago, Boussingault, one of the most laborious and accurate of living chemists who have devoted themselves to agricultural subjects, commenced the inquiry, and received it therefore for a period of three-and-twenty years, he assisted by M. Lewy, and M. G. Ville, another French chemist, who worked at the subject for many years, owing to an opposite conclusion. Another series of investigations have been undertaken by Mene, Boussingault, and Grandeau, Dr Lawes, Hunting, and Chittenden and Pennington, with considerably varying results. Lastly, the field and other experiments at Rothamsted, having shown how important was a definite settlement of this question, and demonstrating how conflicting was the existing evidence bearing upon it, the investigation was undertaken there, and a very intelligent young American chemist, the late Dr. Pugh, was engaged upon the subject, at the Rothamsted Laboratory, for nearly three years. Well, the result of all this expenditure of time and money, extending over a period of more than three-quarters of a century, is a balance of evidence in favour of the view that the free nitrogen of the atmosphere cannot be assimilated by our crops.

One more illustration, and I have done with this part of my subject. It may be taken as an established fact that if the price of the hay, cake, or corn, and roots, which the farmer gives to his oxen and sheep or of the meal which he gives to his pigs, be charged against the animal, the cost of the food will be more than the increased value in the shape of meat. To show a profit upon the feeding transaction, it is necessary to charge a portion of the cost of the food against the manure obtained. It is, however, quite possible to keep land in high condition for growing corn, without the manure produced by feeding stock. Whether it will be the more advantageous to attain the end by the production of meat and of animal manure, or by the use of artificial manures, is entirely a question of cost, depending on the character of the land, the prices of meat and corn, and the relative cost of certain constituents in cattle manure, and in artificial manures. But, obviously, essential elements in the inquiry are—what proportion of the various constituents of the purchased cattle food will be obtained in the form of meat?—what proportion will be expended or lost by the respiration and perspiration of the animal?—and how much will remain as manure?

Let me put a case to illustrate the point in question. 1 cwt. of rape cake will cost six shillings, and 1 cwt. of linseed-cake about twice as much. If applied as manure to the soil, these two substances would be of very nearly the same value as manure. Both would supply about 8 lbs. of mineral matter, and about 90 lbs. of organic matter, containing nitrogen equal to about 64 lbs. of ammonia. But the linseed-cake is first employed for the feeding of stock, and the questions arise—how much of the above constituents will go to form increase? how much will be expended or lost by the vital processes of the animal? and how much will remain for manure? Now, these points can only be settled by laborious scientific investigation. I could give you a long list of the names of those who have experimented upon one or other branch of the inquiry; and the subject, in one or other of its aspects, has been under experiment at Rothamsted, from time to time, for more than twenty years. Well, it may perhaps safely be assumed that, of the total dry or solid matter of the linseed-cake, not more than 10 per cent., and of its total nitrogen not more than 5 per cent., will be retained by the animal as increase. Of the total solid matter, however, a large proportion will be expended by the respiration of the animal, leaving, in fact, only about 25 or 30 per cent of the whole as manure. But the essential point whether, besides the small proportion of the nitrogen of the food which is stored up in the increase of the animal, another portion is expended and lost by respiration and perspiration, or whether the whole of that which is not retained by the animal remains as manure, can hardly be said to be absolutely settled. The balance of the evidence is, however, in favour of the view that there is no loss of the nitrogen of the food excepting that which contributes to the increase of the animal, and that which may be due to the decomposition of the manure after the animal has produced it.

I have brought forward these illustrations to show you how much time, labour, and money, must be expended in scientific enquiry, before some of the most fundamental practices of agriculture can be thoroughly understood; and before, therefore, the *L. s. d.* standard of calculation can be rigidly applied to them. Whilst, however, much remains to be done before we can discuss some important branches of the science of agriculture "with a view to profit," we can, I think, in the meantime, learn much from the results of field experiments, if conducted on a sufficiently large scale, for a sufficient length of time, and with due regard to accuracy. I believe the experiments at Rothamsted meet these requirements, and I now propose to consider how far the results of some of them are applicable to agriculture "with a view to profit."

Among the results of the Rothamsted field experiments, there is one fact which stands out with the greatest possible prominence—viz., that certain substances, which constitute a very small proportion of the crops, exert a very striking influence on their growth when employed as manures. Thus, nitrogen, in the form of ammonia-salts, or nitrates of soda, used in admixture with superphosphate of lime, and applied to the Rothamsted soil when in an agricultural sense in a state of exhaustion—that is, when it is right to grow another grain crop without manure—will yield a full crop of corn; and with a repetition of the manure each year, will continue to do so for many years in succession.

For example, a mixture of 200 lbs. of superphosphate of lime and 200 lbs. of ammonia-salts, applied every year for nineteen years, has yielded almost exactly the same amount of barley as 392 lbs. of superphosphate of lime and 1,000 lbs. of rape-cake, or as 14 tons of dung, applied annually for the same period. Each of the three has given an average of about 48 bushels, or 6 quarters of barley, and about 28 cwts. of straw. Nitrate of soda has not been used in similar combination for so long a period; but it may be assumed that if, instead of the 200 lbs. of ammonia-salts, 275 lbs. of nitrate of soda had been employed every year with the superphosphate of lime, almost identically the same result would have been obtained.

Now let us compare the quantity of certain constituents in 48 bushels of barley and its straw, with that of the same constituents

contained in the abovenamed different kinds of manure which will produce it. The following table illustrates the point :—

	Dry Organic matter.	Mineral matter.	Nitrogen.
	lbs.	lbs.	lbs.
6 qrs. barley, and 36c. straw	4,500	120	30
14 tons farm-yard manure	9,407	[illegible]	210
1,000 lbs. rape-cake	810	90	50
200 lbs. ammonia salts	...	...	41
275 lbs. nitrate of soda	...	...	61

Thus, of dry organic matter, the crop would contain about 4,566 lbs., or rather more than two tons. Of such substance, the annual dressing of dung would supply nearly twice as much, and the rape-cake not one-fifth as much as the crop contained; whilst the ammonia-salts, or nitrate of soda, would supply none at all. Of mineral matter, again, the dung would annually supply very much more, and the rape-cake very much less than the crop contained. Of nitrogen too, the dung would contain from three to four times as much as the crop; whilst neither the rape-cake, the ammonia-salts, nor the nitrate, would contain as much as the crop. Practically, then, we obtain the same quantity of corn and straw whether we supply much more or much less organic matter than the crop contains, or even none at all.

A similar result is brought out even more strikingly in the experiments on the continuous growth of wheat. To one plot in the experimental wheat field, 14 tons of farmyard dung per acre have been applied annually for twenty-seven years in succession; but the amount of produce yielded by it is exceeded by that from mixtures of mineral and nitrogenous manure, supplying no organic matter whatever. It may be considered established, then, that at any rate, in the case of moderately heavy soil such as that at Rothamsted, the only manures required for the production of good corn crops for a number of years in succession, are such as will supply certain mineral constituents and nitrogen, the latter either in the form of ammonia-salts or nitrate of soda.

Referring again to the results with the barley, I wish to recall your attention prominently to the fact, that the 14 tons of farmyard manure, which gave only the same amount of produce as the mixture of superphosphate of lime and ammonia-salts, or superphosphate of lime and nitrate of soda, not only supplied large quantities of organic and mineral constituents of which the artificial mixtures contained none, but it also supplied probably between four and five times as much nitrogen as either of the artificial mixtures, and yet only gave the same amount of crop. The salts of ammonia supplied 41 lbs. of nitrogen in the form of ammonia; the nitrate of soda also 41 lbs. in the form of nitrate acid; and, for some years, an amount of ammonia-salts containing 82 lbs. of nitrogen was applied to one series of plots, but this was found to be too much, the crop generally being too heavy and laid. Yet, probably, about 200 lbs. of nitrogen was annually supplied in the dung, but with it there was no over-luxuriance, and no more crop than where 41 lbs. of nitrogen was supplied in the form of ammonia or nitric acid. How is this to be accounted for?

The answer to this question must be that the activity of vegetation does not depend alone upon the mere amount of the required constituents provided within the soil, but very materially also on the state of their combination and distribution, being such that they can be taken up by the growing plants. Only a comparatively small proportion of the nitrogen of the dung exists as ready-formed ammonia, and the remainder only very gradually passes into that state of combination. Hence it is that dung is found to be what is considered by some so desirable—namely, a lasting manure: that is to say, a manure which only yields up its fertilizing constituents very slowly. Salts of ammonia and nitrate of soda are, on the other hand, both very soluble in water; but, when applied as manure, the ammonia of the ammonia-salts is much more readily absorbed and retained by the soil than is the nitric acid of the nitrate. The latter, consequently, distributes more rapidly, and is more liable to be dissolved by heavy rains, and washed into the drains, or the sub-soil; though a portion of the ammonia of the ammonia-salts itself becomes converted into nitric acid, and, then is subject, in like manner, to loss by drainage.

The farmer has, therefore, to deal with that very important constituent of manure—*nitrogen*—in very different conditions of combination, in which it acts very differently when applied to the soil. It is probable that when the reactions of these various descriptions of nitrogenous manure on different descriptions of soil have been more carefully investigated, and are better understood, some considerable saving may be effected in their use. At Rothamsted, in the experiments on wheat, less, and in those on barley, not much more, than half of the nitrogen supplied as ammonia-salts or nitrate of soda is recovered as increase of produce in the first crop; and only from one-sixth to one-fifth of that which is supplied in the form of dung is so recovered. Our attention is now directed to this subject, and experiments are in progress to determine whether a reduced amount of these valuable manures will not yield an equal result, if applied more carefully in close proximity to the growing plant.

Taking, however, the Rothamsted experiments as they stand, let us now examine—what results they give when brought to the standard of profit and loss? In the barley field the average annual produce obtained by the annual application of 300 lbs. of superphosphate of lime, and 200 lbs. of salts of ammonia, or instead 275 lbs. of nitrate of soda has been, as already stated, about 6 quarters, or 48 bushels of dressed corn, and 22 cwts. of straw. As the supply of nitrate of soda in the market is much greater than that of the ammonia-salts, I will adopt the nitrate as the basis of calculation. We have then the cost of the crop per acre, approximately as follows:—

275 lbs., or say 2 cwts. nitrate of soda, at 16s.			
3½ cwts. superphosphate of lime, at 3s.			
Sowing manure			
Seed, tube, and rates			
Ploughing			
Scarifying			
Harrowing			
Rolling			
Drilling			
3 bushels seed, at 6s. 6d.			
Hoeing and weeding			
Harvesting			
Thrashing and dressing, at 3s. per qr.			

The above may be considered as a close approximation to what would be the annual cost of growing a crop of barley for a number of years in succession, at Rothamsted.

On the other side of the account we have—

6 quarters of dressed barley, at 42 lbs per quarter			
3 bushels of other barley, at 3s. 6d.			
22 cwts. of straw, at 1s.			
Cost of the crop			
Profit per acre			

I will next call your attention to a few of the experiments on the continuous growth of wheat. The first crop of the series was harvested in 1844, and the 28th in succession is now growing. Omitting the results of the first eight years—1844 to 1851 inclusive—when the manures were not exactly the same as they have been since, we have, as in the case of the barley, a period of 19 years—1852 to 1870 inclusive—during which the same manures have been applied to the same plots year after year. Plot 5 has received each year a mixture of salts of potash, soda, and magnesia, and superphosphate of lime; plot 6 the same mineral manures as plot 5, with 200 lbs. of ammonia-salts per acre; plot 7 the same mineral manures, and 400 lbs. of ammonia-salts per acre: and plot 9 the same mineral manures, and 550 lbs. of nitrate of soda, per acre. The following are the average results over the 19 years:—

Per Acre, per Annum; 19 years, 1852-1870.

Plots.	Manures.	Average Produce. Dressed Corn.	Straw.
		Bush.	Cwts.
5	Mixed mineral manure, alone	17	15
6	Do., and 200 lbs. am. salts	27	25
7	Do., and 400 lbs. am. salts	36	36
9	Do., and 550 lbs. nit. soda	37	41
2	14 tons farmyard dung	36	34

Thus the mixed mineral manures alone give, over 19 years, an average annual produce of wheat of 17 bushels of corn, and 15 cwts. of straw, per acre. The addition of 200 lbs. of ammonia-salts per acre to the mineral manures, gives an increase of 10 bushels of corn, and 10 cwts. of straw; the addition of 400 lbs. of ammonia-salts to the mineral manures, gives an increase of 19 bushels of corn and 21 cwts. of straw; and the addition of 550 lbs. of nitrate of soda to the mineral manures, gives an increase of 20 bushels of corn and 26 cwts. of straw. The farmyard dung, on the other hand, gives the same amount of corn, but 2 cwts. less straw than the mineral manures, and 400 lbs. of ammonia-salts; and 1 bushel less corn, and 7 cwts. less straw than the mineral manures, and 550 lbs. of nitrate of soda.

It is evident from these results that, in the case of moderately heavy land like that of the experimental field at Rothamsted, full crops of wheat may be grown for many years in succession, by means of the annual application of certain mineral constituents, with ammonia-salts or nitrate of soda in addition.

Taking again the cost and result with nitrate of soda as the basis of calculation, the following will be the money account per acre of the experiment on the continuous growth of wheat:—

550 lbs., or say 5 cwts., nitrate of soda, at 16s.			
Salts of potash, soda, and magnesia			
3½ cwts. superphosphate of lime, at 3s.			
Sowing manure			
Seed, tube, and rates			
Ploughing			
Scarifying			
Harrowing			
Rolling			
Drilling			
3 bushels seed, at 6s.			
Hoeing and weeding			
Harvesting			
Thrashing and dressing, at 3s. per quarter			

On the other side of the account, we have—

	£	s.	d.
[illegible] bushels of [illegible] wheat, at 6s.	11	2	0
[illegible] bushels of other [illegible], at [illegible]	0	[illegible]	[illegible]
[illegible] cwts. of straw, at 20s. per ton (1,000 lbs.)	2	10	10
	14	17	10
Cost of the crop	13	3	6
Profit per acre	£1	13	4

There are several reasons why the results with the wheat are not so satisfactory as those with the barley in point of profit. The crop is much more costly to keep clean; and, as you will see, I have charged seven shillings for hoeing an acre of barley, but twenty shillings for hoeing and cleaning an acre of wheat. Again, for a given weight of corn, there is nearly one-and-a-half times as much wheat straw as barley straw; and with the winter-sown, and stronger straw crop, we are enabled in the average of seasons, to ripen a greater weight of total produce. The result is, that to obtain a full crop of wheat, we have to employ about twice as much ammonia-salts, or nitrate of soda, as is required to yield what may be called a corresponding crop of barley. Thus 48 bushels of barley and 36 or 37 bushels of wheat may be taken as of nearly equal money value; but to grow 48 bushels of barley we have used only 200 lbs. of ammonia-salts, or 275 lbs. of nitrate of soda, producing at the same time only 28 cwts. of straw; whereas to get 36 or 37 bushels of wheat we used 400 lbs. of ammonia-salts, or 550 lbs. nitrate of soda, and produced about two tons of straw, withdrawing, of course, at the same time much more mineral matter from the soil.

It is obvious that in growing wheat or barley year after year by the manures above described, and removing both corn and straw from the land, the exhaustion of mineral constituents will show itself sooner in the case of wheat than in that of barley. Hence it is that, in the wheat account given above, there is the heavy charge of 10s. for salts of potash, soda, and magnesia; whilst there is no such charge against the barley crop. The amount of those salts annually used in the particular experiments quoted was, it is true, considerably more than would be required to compensate for the exhaustion by the increase of crop obtained. It must be distinctly borne in mind, however, that the Rothamsted experiments are not arranged with a view to providing direct examples of profit. At the same time, the fact is clearly brought out, that more money must be expended on nitrogenous manures to yield a given money-value in wheat-grain than an equal value in barley-grain. Calculations show, indeed, that of a given amount of the expensive constituent nitrogen supplied in manure, a larger proportion is taken up from the soil by the barley than by the wheat crop.

To conclude, in regard to the wheat experiments, I am sure you will agree with me that the fact of having removed 27 full crops in succession from the same land, is one of the greatest possible interest and importance, as showing what constituents must, and what need not, be applied to the soil for the successful growth of the crop. But, although the growth of wheat under such circumstances may require the employment, as manure, of expensive constituents, such as potash, it is by no means to be concluded that such manures would be required under the very much modified application of the system of more frequent corn growing, which would alone be followed in farming "with a view to profit."

As the experiments on the continuous growth of roots at Rothamsted have as yet only extended over two seasons, I will not occupy your time by following up the illustration as to profit in regard to that crop. The land devoted to the experiments was dunged for beans in 1864, after which grew wheat in 1865, beans in 1866, and wheat in 1867 and 1868, all without manure, and the first experimental root crop was taken in 1869. In regard to the results it will suffice to say that the use of a mixture of superphosphate of lime, salts of the alkalies, and ammonia-salts, or nitrate of soda, as was employed for the wheat (on plots 7 and 9 respectively), gave, in the favourable season of 1869, about 70 bushels of oats, and about 50 cwts. of straw, and in the unfavourable one of 1870, about 50 bushels of oats and 28½ cwts. of straw.

I will now direct your attention to some experiments on rotation. In one field at Rothamsted, an experiment on rotation of crops has now been carried on for nearly twenty-four years. The course followed is turnips, barley, clover, beans or fallow, and wheat. On one portion the Swedes are very highly manured with a mixture of rape-cake, salts of ammonia, superphosphate of lime, and salts of potass, soda, and magnesia. From one-half of this piece the whole of the Swedes, both roots and tops, are carted off; and on the other half the crop is consumed on the land by sheep. The 24th or 5th, that is, the last of the sixth course, is now growing. Omitting the first course, in which Norfolk whites and clover were grown, and the sixth, which is not yet completed, the following are the quantities of roots, and of dressed corn, per acre, obtained in the second, third, fourth, and fifth courses:—

Crop, &c.	Swedes carted off the land	Swedes consumed on the land.
2nd Course.		
1852 .. .. Swedes	15¼ Tons.	16¼ Tons.
1853 .. .. Barley	36¼ Bushels.	35¼ Bushels.
1854 .. .. Beans	19 "	18 "
1855 .. .. Wheat	27½ "	40 "
3rd Course.		
1856 .. .. Swedes	16¼ Tons.	17 Tons.
1857 .. .. Barley	45 Bushels.	47½ Bushels
1858 .. .. Beans	13¼ "	14 "
1859 .. .. Wheat	38¼ "	38¼ "
4th Course.		
1861 .. .. Swedes	44 Tons.	31 Tons.
1862 .. .. Barley	47½ Bushels.	34¼ Bushels.
1863 .. .. Beans	15¼ "	11¼ "
1864 .. .. Wheat	46¼ "	44¼ "
5th Course.		
1864 .. .. Swedes	27 Tons.	21 Tons.
1865 .. .. Barley	47½ Bushels.	42¼ Bushels.
1866 .. .. Beans	14¼ "	14¼ "
1867 .. .. Wheat	35 "	31¼ "
Summary average of the four Courses.		
1852, '56, '62, '64 .. .. Swedes	13¼ Tons.	12 Tons.
1853, '57, '61, '65 .. .. Barley	44 Bushels.	39 Bushels.
1854, '58, '63, '66 .. .. Beans	15¼ "	13¼ "
1855, '59, '64, '67 .. .. Wheat	36¼ "	36¼ "

Thus the average produce of Swedes was about 12 tons of roots, and there were besides about ¾ ton of tops. The manures applied to each crop of turnips, if they had been employed directly for barley, would have been sufficient to grow three crops of about 6 quarters each: that is, in all, 18 quarters of barley. Yet we find that the average yield of the rotation where the whole of the roots were consumed on the land, was almost exactly the same as where they had been carted off. The condition of these two plots must, however, have been very different. The amount of nitrogen alone returned to the land by the stock consuming the turnip crop, would probably be equal to that contained in between 400 and 500 lbs. of nitrate of soda.

From the results of these experiments we may learn:—

1. That the growth of the root crop did not of itself contribute anything to the fertility of the land.

2. That the treading of the land by the stock was injurious to the succeeding barley crop.

3. That it is not, here the quantity of manurial constituents applied which determines the amount of the crop, but that the effect depends very much upon the condition in which the constituents exist within the soil.

A careful consideration of these results, and also of those of experiments in which Swedes have been grown year after year for many years in succession on the same land, leads me to the conclusion, that on the heavier class of soils, where the treading of sheep is injurious, the turnip crop, if not cut of place, might at all events with advantage occupy a much less proportion of the area of the farm than it usually does. There are many and obvious reasons why it would be impracticable to devote the whole of the arable land of a farm to the growth of corn; and if I were farming with a view to profit alone, I should not attempt to do so. But, taking as a basis the facts that on moderately heavy, and heavy land, full crops of wheat, barley, or oats, may be grown with certainty for some years in succession, by means of artificial manures containing soluble phosphate, and nitrogen in the form of ammonia or nitric acid, and that the increased produce obtained by these manures is remunerative, I should certainly devote a much larger proportion of my land to corn than is usual in the district. To give an example of what I have done in this direction, I may mention that a field adjoining the experimental barley field, received a heavy dressing of dung and artificial manure for mangolds in 1866, and since then it has grown wheat, oats, barley, and barley, in succession. The last two crops of barley have each been fully seven quarters per acre, and another corn crop is to be taken from the land in the coming season.

I am also disposed to give up the growth of turnips altogether, growing no other roots but mangolds, and these probably to the extent of not more than 1/15th or 1/20th of the arable land of the farm. Under this system the land for the mangolds should be manured very heavily, with dung applied partly in the autumn and partly in the spring, and also with artificial manure at the time of sowing. It would be advisable, too, to prepare the land for the spring corn as much as possible in the autumn by means of steam; and, of course, altogether to avoid injury by treading with sheep in wet weather. To what extent such a system would be applicable and profitable in other districts must be left in great measure to the judgment of the individual farmer to decide.

In the "Report on the Farm-Prize Competition, 1870," published in the last number of the *Journal of the Royal Agricultural Society of England*, Mr. Keary condemns the system of growing more frequent corn crops, by the use of artificial manures. On the other hand, in the *Agricultural Gazette* for November 5 and November 19, we have an account of the successful cultivation of a farm on which 230 to 350 acres of grain are grown out of a total area of 450. The whole produce, corn and straw, is sold off the farm; no stock is kept, and no meat is produced. There can be no difficulty whatever in agreeing with Mr. Keary in doubting whether, upon light soils, where the treading of sheep is beneficial, "the alternation of green and white crops can properly be departed from;" and, for my part, I do not recommend that it should be on such soils, unless under very special circumstances. I equally agree with Mr. Prout, that on soils of quite another description, both roots and stock may be more plague than profit; and, in fact, that, by means of steam, or other deep cultivation, and the judicious employment of those special fertilizers which experience shows to be advantageous, remunerative corn crops can be grown over a larger area of the farm than is consistent with our recognized systems of rotation. Cleanliness is, however, an essential element in the profitable growth of corn; and when the land becomes foul, the corn growing should be suspended, and a fallow or cleaning crop taken.

The time is past for maintaining a servile adherence to fixed systems of rotation as essential to profitable agriculture, whatever the description of the land, the intelligence of the farmer, or the local conditions of his farm. Whether we look to the greatly extended knowledge of the present cultivators of the soil, to the greatly increased command of the element of fertility in the form of purchased cattle foods and manures, to the marvellous development of mechanical appliances, or to the increased facilities for transit and for the carriage of produce, it must be admitted that the farmer of the present day, as compared with his predecessors, has very marked advantages. And it is only reasonable to suppose that these great changes should have a commensurate influence in modifying systems and practices which owe their origin and their reason to other times and to other circumstances.

In conclusion, if those who farm "with a view to profit" can gather nothing else from the results of the Rothamsted experiments, they may at least learn with what certainty of results certain manurial substances may be employed for the increased production of some of the most important crops which they cultivate; and I am sure I may safely leave it to the intelligence and the judgment of those I am addressing, to decide, each for himself, how far his own particular soil, and other circumstances, will justify him in modifying his present practice in the direction I have indicated.

Rothamstead, December 1870.

AGRICULTURAL STOCK—INDIA.

THE PRINCIPLES OF BREEDING STOCK.

At a meeting of the Midland Farmers' Club, held on Thursday (June 8th), Mr. Finlay Dun read a paper on "some of the principles concerned in the breeding of stock." He commenced by adverting to the famous character of our stock, and in proceeding to speak of the necessity of upholding that well-earned fame, he said :—

One of the most notable and generally recognized principles of stock-breeding was expressed in the familiar axiom "like produces like." The most insignificant plant produced plants the facsimile of itself, and experienced flockmasters and attentive shepherds could readily distinguish lambs descended from particular rams. Not only were the good qualities of parents transmitted to their offspring, but faults, imperfections, and diseases. Amongst cattle, good milking properties, difficult calving, tendency to puerperal fever, and many other diseases, were inherited both from the male and female parents; and frequently, amongst thorough-bred stock, the chestnut colour of some of the old stud horses cropped up. From ignorance, and still more often from a penny-wise and pound-foolish policy, early and delicate animals were used for breeding purposes. The practical conclusion from those premises was obvious. Both males and females intended for breeding purposes must be well formed, suitable for the purposes for which they were intended, and of sound and vigorous constitutions. In the breeding of stock, the progeny not only resembled their own immediate parents, but they called back or reverted to by-gone generations; and it was difficult to say for how many generations old peculiarities would continue to crop up. Shorthorn authorities demanded four distinct crosses of accredited blood as the minimum amount, without which no animal could be regarded as of sufficiently pure descent to be admitted into the "Herd Book." It was evident that the more inherent or family characters, rather than the accidental or individual ones, were more particularly transmitted from the parents to their offspring. To ensure definite results in breeding, the pedigree and antecedents of the parents must be known; and in this alone was the transmission of desirable characters certainly secured. In the successful breeding of sheep, the importance of using well-bred rams of established and fixed characters is now generally admitted by all intelligent flockmasters. The laws of variation must also be considered. Nature was so profuse in her variety, and so fertile in her resources, that more slavish copies were never produced. Although to the superficial gaze, animals and plants appeared identical, the variability of each was very great. But the law of variability had an evil as well as a good aspect. Whilst on the one hand there was fortunately a tendency to increase of size, and vigour, and fertility, there was unfortunately on the other a like tendency to weakness, to deterioration, and to infertility. It therefore behoved stock-breeders to be more careful than they were to choose the most desirable variations. Care should be taken to avoid extremes in the breeding of stock. No dependence could be placed on the union of animals possessing dissimilarity of size, of type, or even of colour. The produce of such unions was irregular, sometimes following one parent and sometimes the other, while they were apt to develop the bad rather than the good qualities of each. The practice of breeding "in and in" had been successfully pursued with some of the best race-horses of former days, while in the pedigree of the best shorthorns, the close breeding of some of the most celebrated animals was apparent. Breeding "in and in," when carefully, rationally, and occasionally pursued, had certainly the merit of improving the quality, style, and neatness of the stock, and perhaps also of giving fixity and permanence to any good qualities, but wherever excessively or injudiciously pursued, it brought many evils in its train. The relative position of male and female in the development of their offspring had given rise to much speculation and discussion. At one time it was believed that the female exercised a passive influence only, but there was no doubt that both parents contribute tolerably equally to the development, although certain parts of the organism appeared to be more especially moulded by each parent, a fact first clearly pointed out by Mr. Orton, of Sunderland, in a most interesting paper published by him in 1854. According to this view, the male impresses more especially his character on the bones, skin, external configuration, and limbs; whilst the female contributes more particularly to the internal organs, the temperament, and disposition. In other words, the male gives the external or locomotive organs; the female, the internal or vital organs. From this law, two important practical deductions might be drawn :—(1). Never to use male animals of faulty form, or with weak, badly shaped, or diseased limbs; and (2) never to use for breeding purposes, females with narrow, contracted chests, weak loins, or delicate constitutions. Prepotency of particular breeds, and of particular animals, was worthy the consideration of the careful breeder. Prepotency occurred in either sex, but was usually most developed in the male. Amongst horses, some of the best thorough bred families, and shorthorns amongst cattle tribes were notably prepotent, and when crossed with Herefords and longhorns, speedily wiped out, as it were, their specialties. Not only was the habitual and dynamic state of parent transmitted to their offspring, but he had noticed that the produce of worn-out mares and cows showed constitutional debility, and were difficult to rear. The crossing of different varieties of plants and animals was sometimes of great importance to the agriculturist. Amongst the domestic animals, the first cross between somewhat remote families of the same species answered well enough, the offspring surpassing the parents. It was, however, difficult to go on breeding satisfactorily from such cross breds. The first crosses between the shorthorn and West Highland or polled cow were generally admirable butchers' beasts, following the sire in size and precocity, and the dame in hardiness as well as fine quality of meat. But with neither of the parent stocks did those cross-breds pair satisfactorily. It required at least four or five generations of judicious crossing and liberal drifting to obtain the uniformity of either of the parent breeds. The careful matching of different varieties of animals with subsequent judicious selection, had evidently been the means whence had been produced some of the most valuable domestic animals, such, for example, as the race-horse and Cleveland Bays, the Galloways, the Shorthorns and Herefords, and within the present century, the Hampshire, Wiltshire, Shropshire and Oxfordshire Downs. In judicious and practical hands, extreme crossing had occasionally been serviceable, but of course, the produce of many of the earlier generations were by no means what was wanted, and required to be weeded out.

RICE CULTIVATION.

CULTIVATION OF CAROLINA RICE IN INDIA.

A PRECIS of the reports received from different districts in Bengal, the North-Western Provinces, Punjab, Madras, Burmah, and Ceylon, on the result of the experimental cultivation of Carolina rice seed received from England in 1868, and of acclimatised seed from Madras, is published in the *Gazette of India*. On these reports the Government of India has passed the following resolution :—

"Experiments in the culture of this exotic staple have been carried on since 1868, and the papers read above contain the results of the experiments made in 1868, 1869, and 1870 in the Bengal Presidency, and certain districts in Madras, and Ceylon. Although the Government of India is not yet in a position to decide authoritatively as to the exact merits of the Carolina paddy, as compared with the several indigenous varieties, and although the opinions of different officers, and the reports of the results attained in different localities are very discordant, there appears to be generally a balance in favour of the superior utility of the American plant.

"The advantages which this exotic possesses over the indigenous varieties, may be briefly summed up as follows :—

I.—The Carolina paddy plant is more hardy, as it is less easily injured by gales and heavy rains, which entirely prostrate the Indian kinds. It requires a less amount of water than the Indian plant, it suffers less from drought, and also (according to some authorities) from floods.

II.—The produce of this species of rice is much greater than that of the country kinds.

[illegible]

III.—[illegible] the Coast of Carolina for one of the [illegible]

IV.—[illegible] rather than [illegible]

2. [illegible] following are the disadvantages of the [illegible]

I.—[illegible] in any case to Indian [illegible] is somewhat [illegible] favour and scarcely any [illegible]. It is believed to [illegible] less [illegible] by native cultivators and consequently to present a lower price amongst them.

II.—The grain is much more difficult to thresh out.

III.—The straw is coarser, and, in some localities, is said to be less liked by cattle.

3. "Considering how little justice has on the whole been done to the cultivation of this foreign staple, and that it is quite a recent introduction into this country, the Governor-General in Council thinks it may safely be concluded that the balance of advantages is in its favour, and that it is expedient to continue the trial. His Excellency in Council accordingly directs that the local Governments and Administrations in the Bengal Presidency be requested to state as early as possible what quantity of seed they will require, and by what time it should reach them. Application will then be made to the Secretary of State for a supply of seed of the finest quality.

4. "His Excellency in Council also directs that, besides the supply it is intended to obtain, instructions be issued to district officers to collect all existing seed, and to take particular care that all seed produced by the cultivation of the supply to be procured through the Secretary of State is carefully preserved for use in 1872.

5. "The Governor-General in Council attaches great importance to the experimental cultivation of this rice, and trusts that the local Governments and Administrations will do their utmost to make this trial a really satisfactory and conclusive one,—not necessarily attempting it in all districts, but carefully selecting the most favourable localities and the most careful officers, and making such arrangements as will ensure the receipt from them of full and correct accounts of the results obtained. His Excellency in Council considers that for this purpose it would be advisable for the local Governments and Administrations at once to decide where and under which district officers the cultivation should be carried on, so that no delay whatever might occur in the distribution of the seed when it arrives.

6. "The Secretary of State will be requested to procure and send out as early as possible by the Suez Canal, 50 barrels of seed of the first and best quality, with an intimation that, if necessary, a further quantity will be indented for, on receipt of replies from the several local Governments to the enquiry made in paragraph 3."

IMPROVEMENTS IN INDIAN AGRICULTURE.

RESULTS OF AN EXPERIMENT IN THE CULTIVATION OF "OOSUR" LAND IN THE NORTH-WESTERN PROVINCES.

From Colonel F. H. Rundall, R. E., Deputy Secretary to the Government of India, Public Works Department; to the Joint Secretary to the Government of the North-Western Provinces in the Public Works Department, Irrigation Branch,—No. 301 I, dated Simla, the 19th August 1871.

I am directed to acknowledge the receipt of your letter, No 708 I—C of the 12th instant, and papers enclosed, describing the results of an experiment in the cultivation of "oosur" land, *i. e.*, land affected by the "reh" efflorescence, in the Allygurh Division, Ganges Canal.

In reply, I am to state that His Excellency the Governor-General in Council is of opinion that there is no subject more interesting or important than that of the reclamation of "reh" lands, and considers that all experiments in this direction should be greatly encouraged, and their results most accurately recorded.

The present experiment seems to lead to the conclusion that the process of efflorescence is generally a gradual one; that the saline particles come slowly to the surface, and, when caused by the saturation of canal water, can be counteracted by constant but very deep cultivation.

It certainly appears to be a more promising experiment than those by which "reh" can be supposed to be counteracted by deep thorough drainage, though His Excellency greatly fears that the process pursued, and apparently with so much success, might only be [illegible] to [illegible] "reh" in the soil.

[illegible] the drainage and irrigation [illegible] to get [illegible] on [illegible] Indian soils, rather thrown on the affirmative by irrigation, would have the effect of rapidly [illegible] drains, it is not possible at present to determine.

In India, however, where labour is so cheap, and in the irrigated districts chiefly, where the produce is so valuable, an experiment of this kind would be worth trying, and it appears very probable that open drains, 100 to 150 feet apart, and about 3 feet deep, might be found sufficient to prevent efflorescence in the intervals, especially if irrigation were constantly in use. These drains, will, doubtless, have to be scoured perhaps more than once in a year; but the process in soft alluvial soils would be extremely inexpensive and easy.

There may, however, be many descriptions of, and causes for saline efflorescence, all of which would probably require different treatment. Although land on which "reh" efflorescence is also called "oosur," the true *oosur* is understood to be land free from efflorescence, but is underlaid at a depth of from 6 inches to one foot by a stratum, more or less continuous, sometimes of considerable thickness of kankar, sometimes in block (known as *silla*), and at other times in *strings* and nodules. "Reh" is of course merely a generic name for all saline efflorescences. Sometimes it is an impure sulphate or carbonate of soda, sometimes a *bona fide* chloride of sodium, and sometimes carbonate or nitrate of potash, but generally more or less a mixture of all. It rises to the surface by capillary attraction.

In conclusion, I am to communicate to the Government, North-Western Provinces, the thanks of His Excellency for the interesting information afforded in the present papers, and to say that the foregoing remarks should be regarded as suggestions made with the view of eliciting discussion, and that a further report will consequently be awaited of the experiments ordered to be undertaken on the larger scale.

Nos. 392—400 I.

Copies of this correspondence forwarded to the Agricultural Department and the Local Governments and Administrations * noted for information, and to the Home Department for publication in the *Gazette of India*.

From R. E. Forest, Esq., Officiating Joint Secretary to the Government, North-Western Provinces in the Public Works Department, Irrigation Branch; to the Secretary to the Government of India, Public Works Department,—No. 708 I.—C., dated Nynee Tal, the 12th July 1871.

I am directed by His Honor the Lieutenant-Governor of the North-Western Provinces to refer to your No. 1471 of the 21st May 1869, and to forward, for the information of His Excellency the Governor-General in Council, copies of the papers noted below † containing a very interesting report by Captain Parsons, Executive Engineer Allyghur Division, Ganges Canal, on the results of an experiment in the cultivation of "oosur" land, *i. e.*, land affected by the "reh" efflorescence.

From Captain O. S. Moncrieff, R. E., Officiating Superintending Engineer, 1st Circle, Irrigation Works, North-Western Provinces; to the Joint Secretary to the Government, North-Western Provinces, Public Works Department, Irrigation Branch,—No. 1996, dated Meerut, the 22nd June 1871.

Cultivation of Oosur Land in the Allyghur Division, Ganges Canal.

In reply to General Order No. 1189 I, of 17th April, I have the honour to forward an interesting report by Captain Parsons on an experiment made in his division by Sub-Conductor McArther, on the reclamation of "oosur" land. This shows an actual cost of reclamation of Rs. 41 per acre, and a probability that two years' produce would cover this outlay. It remains of course to be seen whether the salts will rise again in the soil or not, and how often the process of trenching and manuring may be necessary. As I think, too, that both Captain Parsons and Mr. McArther are apt to be sanguine in their views, I am far from looking on this remedy for "oosur" land as proved. It is, however, a very interesting and so far successful experiment, and I would respectfully suggest that a small sum, say Rs. 500, might be well expended on repeating it on a larger

* Madras, Bombay, Bengal, Punjab, Oudh, Central Provinces, British Burmah, Mysore and Coorg, Hyderabad, Central India, Ajmere, and Sind.

† No. [illegible], dated 21st June 1871, from the Officiating Superintending Engineer 1st Circle, Irrigation Works.

No. [illegible], dated 14th [illegible], from the Executive Engineer Allyghur Division, Ganges Canal, to the address of the Officiating Superintending Engineer, 1st Circle, Irrigation Works.

Valuation Statement of oosur land, reclaimed in the years 1870-71 and 1871.

General Order No. 708 I—C of 12th July 1871, to Officiating Superintending Engineer, 1st Circle, Irrigation Works.

scale. If such a sum would be put at my disposal, I should like to give about Rs. 300 to the Executive Engineer Allyghur Division, and the balance to the Executive Engineer Bootundshuhur Division. Sub-Engineer Bishee Buksh attached to the latter Division is very well qualified to carry out an experiment of this sort.

From Captain B. J. Parsons, Executive Engineer Allyghur Division, Ganges Canal; to the Superintending Engineer, 1st Circle, Irrigation Works, North-West Provinces,—No. 1044, dated Allyghur, the 14th June 1871.

With reference to your No. 1316, dated 24th April, I have the honour to inform you that two experiments have been made to cultivate 'oosur' land in this division; one has proved successful, and the other failed. The former was carried out on Mr. McArther's method, and the latter according to the verbal instructions of Dr. Jameson.

In July 1870, Mr. McArther took up two pieces of land near the Poordilnuggur bridge, Cawnpore Branch Canal, within our boundaries, aggregating 1¾ acres, on which not even grass would grow.

He first of all spread horse, cow, and sheep's dung over the surface to a depth of about three inches, and damped the soil with canal water. On one side across the full breadth a trench was dug, one foot deep and one foot wide, and the soil used to make a boundary to the field.

Trench No. 2 was then dug a foot from the first, of the same width and depth, and the soil, well mixed up with the manure, was thrown into trench No. 1.

Trench No. 2 was filled up with soil, in a similar way, taken from trench No. 3, and so on, till the whole length of field had been trenched.

All clods were carefully broken up, and all small kunkur and rubbish cleared off the ground.

Small water-course channels were then made, and the ground divided into plots (kyarees) in the usual way, and a top-dressing of manure and silt of about three inches was roughly mixed with the soil by *phowrah* (hoes).

It was then too late to sow rice, so plants nine inches high were purchased, and put in by hand six inches apart, after the *kyarees* had been well flooded.

The crop was above the average of those in the neighbourhood.

After the rice was cut, about the 30th November, barley and peas were sown. The land was ploughed with a country plough one way, and then crossed; and the seed was sown in the furrows made by the second ploughing. The crop received the usual waterings, and seemed to be a most promising one, for it was about 4 feet high on the 23rd February, when a severe hailstorm very nearly destroyed the whole of it. The crop was cut on the 27th March.

On the 8th of April, the land was sown with indigo, and in accordance with the system in vogue, the land was first irrigated, and without ploughing, the seed was sown broad-cast, and the surface merely scratched over with a *babool* branch.

The crop is a most promising one, and there is at present every reason to expect an out-turn of 84 maunds of plant, that is, at the rate of 48 maunds per acre, or 30 maunds per beegah.

In the rubbee of 1871-72, wheat will be sown in these reclaimed "oosur" tracts, and report of the result forwarded in due course.

I selected a few days ago a plot of most unpromising "oosur" land near the Poordilnuggur bridge, and have directed McArther to prepare this land for the next rubbee.

An account current, showing the outlay and return, herewith accompanies.

The other experiment referred to was conducted by Mr. Thornhill in the following way:—The piece of land operated upon was about a beegah. Trenches four feet apart, two feet wide, and two feet deep were dug, and the trenches filled in with silt. Twenty-four loads of manure were then spread over the surface, and the land was then ploughed several times, watered, and sown with indigo. The plant at first came up very thick, but after having been again watered, the ground threw up "reh" which completely destroyed the entire crops.

ALLYGHUR DIVISION,—GANGES CANAL.

VALUATION STATEMENT OF "OOSUR" FIELD RECLAIMED, 1870-71 AND 1871-72.

Dr.

Fuel.	Value of Produce, &c.	Amount.	Total of each Fuel.	Fuel.	Expenditure.	Amount.	Total of each Fuel.
	M. S.	Rs. a. p.	Rs. a. p.			Rs. a. p.	Rs. a. p.
Khurreef, 1870 ...	25 0 Rice (common kurrahee) at Rs. 1-4 per maund ...	31 4 0		Khurreef, 1870 ...	Digging and preparing 1 acre 30 poles ...	...	
	6 30 Rice, table rice (Lall Dum) at Rs. 2 per maund ...	12 8 0			Sprinkling above with canal silt ...	...	
	Rice straw, value ...	7 0 0			Four days,—two carts carting manure, at 8 annas	10	
			50 12 0		Purchase and planting rice plants ...	...	
					Canal water-rate ...	...	
					Cutting and clearing from straw ...	...	
Rubbee, 1870-71 ...	11 30 Barley, at Rs. 1 per maund ...	11 8 0		Rubbee, 1870-71 ...	Three days plough, at 10 annas ...	...	
	3 0 Bhoosa, at 4 maunds per rupee ...	3 0 0			Purchase, seed gram ...	...	
			14 8 0		Ploughing and hoe-ploughing ...	...	
					Canal water-rate ...	...	
					Cutting and threshing ...	...	
Khurreef, 1871 ...	Estimate 84 maunds indigo plant, at Rs. 36 per 100 pounds ...	30 4 0		Khurreef, 1871 ...	Purchase indigo seed ...	...	
					Sowing, 2 months ...	...	
					Cleaning, 24 coolies ...	...	
					Water-rate ...	...	
					Reaping and cutting ...	...	
	Total ...	.....	30 4 0		Total ...	10	10 0 0
	Balance ...	.....	15 6 0				
	Total ...	.....	111 0 0				111 0 0

N.B.—Value of land reclaimed, Rs. 32 per acre. The profits of next rubbee's crop will more than clear the account.

[illegible]

The [illegible] the Lieutenant-Governor [illegible] the receipt of [illegible] 1871, of the [illegible] to convey to Government [illegible] for the interesting and instructive [illegible] on the results of experiment in the cultivation of [illegible] land in the Allyghur Division, Ganges Canal.

A further [illegible] will be looked for of the condition and bearing [illegible] successful plot in reference to the cassia blossom [illegible] for it continues fertile or shows symptoms of recovering [illegible] and turnaround. No absolute conclusions can be formed till we have had a longer and wider experience. Eventually, if the experiment succeeds, the papers will be published; in the meantime, they will be forwarded to the Government of India for information.

His Honor has been pleased to direct that an assignment be made of Rs. 500 from item No. 97 of current year's budget, to enable further experiments being made on a larger scale in the Allyghur and Roorkee Divisions, Ganges Canal, of the sum of Rs. 500 now allotted, Rs. 300 are assigned to the former, and the balance to the latter division.

SUGAR FROM MELONS AS COMPARED WITH SUGAR FROM BEETS.

(From the Chemical News.)

Mr. W. Wanswurn, in a letter to the *Sacramento Union*, maintains that sugar can be made more profitably from melons than from beets. He says :—

The sugar from cane, maple, beets, parsnips, the sweet-gourd, and all the varieties of melons, when manufactured perfectly pure, are chemically identical. In Hungary and Italy there are numerous large establishments for the manufacture of melon sugars. The cost of melon sugar as compared with beet sugar is in favour of the melon. Every German or French authority on the culture of beets for sugar admits the necessity of two, and recommends three, deep and thorough ploughings of the land to properly fit it for the culture of beets. With melons it is quite otherwise. To secure the largest yield and best beets, the seed should be planted in rows two feet apart, and from eight to ten inches apart in the row. For beets, all the land—for illustration say fifty feet in width—must be ploughed at least twice. For melons, only four beds, only twelve feet apart and each only four feet wide or sixteen feet in width of ploughed land, against fifty for beets, will need ploughing.

The great expense of beet culture is in the hand-hoeing and weeding of every row, and in most lands, as many as three of these weedings are required in a season, before the leaves are large and spreading enough to keep down the weeds. The difference between the weeding of four rows of melons and twenty-five rows of beets is very considerable; whilst the exhaustion of the fertility of the soil is in the same proportion. With both crops the land between the rows is kept free from weeds with the horse-hoe or cultivator, at the same expense. Young melon plants are not as tender and delicate for the first eight days as beets. It is evident, therefore, that the expense of culture is largely in favour of melons, it being less than one-third the cost of beets per acre.

In gathering the two crops the difference is again in favour of melons, for they only have to be picked from the vine and thrown into carts; then, without washing or any other process, are ready for the mill. Beets must be first pulled, thrown into heaps to protect them from the sun, then each beet must be handled in having its crown of leaves and rootlets cut off, and then, before it is ready for the rasp or cutter, must be washed thoroughly clean.

The gathering and handling of melons is an agreeable and cleanly operation compared with that of beets. Large quantities of melons in certain localities can be sold for direct consumption in the early part of the season, or whenever worth more in that way than for sugar, spirits, or vinegar; it is not so with beets. Sugar making can commence a full month earlier from melons than from beets, and with winter water melons, as in Hungary, continue on into pa. with beets. Melons yield their seed every year with no extra expense for cultivation. Beets require a second year, with hand, and careful culture and gathering of the seed. Melon seeds will yield sixteen per cent. of their weight of excellent table oil. Beet seeds, beyond what are needed for seed, are of no value. The oil from the surplus seeds of melons equals in Hungary pays one-half the cost of cultivating the entire melon crop. The yield of melons per acre, in favourable soils, is equal to that of beets. The yield of sugar is as seven per cent. from melons to eight per cent. from beets; [illegible] juice and pulp exposed to the air, will turn black in fifteen minutes, and fermentation commences immediately from the rasp. Melon juice and pulp will not blacken at all, and will not begin to ferment in the open air before the third day from the melon. Beets are remarkable for their power of attracting alkaline and saline substances from the soil, which injures their value for sugar. Melons are equally remarkable for letting these salts entirely alone in the soil.

No centrifugals or presses are required to separate the juice from the pulp, as with beets; but all except the rinds and seeds go into the defecating kettles together. Cloth-filters, concentrators, and a vacuum pan are as necessary as for beets. The buildings are less costly, because requiring less strength to hold in position the centrifugals and other necessary machinery for beet sugar factories. The chemical processes of melon sugar making do not differ materially from those for the making of beet sugar, except in their simplicity. Spirits in large quantities can be extracted from the fermented juice of melons and the refuse of the factory, and "pure cider vinegar" is made therefrom in ten hours that cannot be distinguished from the genuine article. The melon rinds, with dry grass or straw, make an excellent food for milch cows.

SALT FOR AGRICULTURAL PURPOSES.

OFFICIAL GAZETTE.

Extract from Board of Revenue Proceedings.

1. The recent importations of English salt at Bombay and Madras have not been so successful as the importers had reason to expect.

2. The Salt Chamber of Commerce at Norwich, through the member for West Cheshire, have recently called the attention of the Secretary of State for India to several hinderances to the free introduction of salt in the two Presidences; amongst other grievances they mention that the Custom House authorities at Bombay, insist on charging the rent of the godown at twice the amount of the rent demanded in Calcutta for similar accommodation; whereas it was understood by the Salt Chamber, that the Calcutta rate would be charged in both Madras and Bombay. They further state that the rent demanded will annually absorb an amount equal to the first cost of the salt in Cheshire.

3. With the view of making Natives acquainted with the character of this salt, they offer to supply both in Madras and Bombay samples free to consumers, provided Government will forego the duty chargeable on the salt.

4. The Duke, in reply, acknowledged the justice of their claims to be allowed to take samples of salt out of bond, duty free, under the same conditions that apply to all new articles of commerce; but denies their claim for godown accommodation on the Calcutta rates.

5. Though the experiment may not in this instance have been a financial success, we cannot but believe that English salt will ultimately become a regular commodity of the Indian bazaar, and that as the imports increase, the difficulties complained of by the importers will disappear.

6. The salt they have introduced is far superior to anything procurable in the bazaars, and the price asked is considerably less. While the English salt is almost chemically pure chloride of sodium, the bazaar salt contains all sorts of impurities, sulphate of soda, nitrates of soda, and potash, lime, &c., and a considerable quantity of earthy impurities. Before the ordinary bazaar salt can be used for the table, fully 10 per cent. of impurities must be removed.

7. Under the peculiar condition of India, perhaps a tax on salt is the best suited for reaching all classes of society, but it is much to be regretted that Indian stock owners should have no alternative but to pay for this necessary for the proper maintenance of the health of live stock 70 Rupees, and in some cases as much as 80 Rs. per ton, for a sample of salt that could in any part of England be purchased by farmers at 10 Rs. a ton. If the Cheshire Salt Chamber will only persist in sending us as good salt as they have already forwarded to India, and supply it at the same reasonable price, there cannot be any

doubt but that ultimately they will do a large trade in this country. In administering Cheshire salt to our cattle, we know what we are giving them, but it is impossible even to guess at the composition of many of the samples of salt offered in the bazaars. A daily dose of chloride of sodium (pure salt) may produce in the animal economy very beneficial effects. But the result of a daily dose of sulphate of soda or nitrate of potash may result in effects anything but beneficial to the interest of the farmers.

COTTON IN THE NORTH-WEST.

COTTON CULTIVATION IN THE NORTH-WESTERN PROVINCES.

"A DISTRICT OFFICER" writes as follows to the *Pioneer*:—

"Having been for some years engaged in experiments with the object of introducing exotic cottons into the N. W. Provinces, it may be as well if my experiences are published for the advantage of others treading in the same path. It may be, that others will be able in the process of time to show I am in error, but they can only do so by future practice and not from past theories. I claim, as a result of my experiments, to have practically demonstrated to a certainty that the cultivation of exotic cottons to a profit in the N. W. Provinces is impossible. Without importing into the controversy the question of small holdings and the impossibility of placing in the market anything like a sufficient quantity to establish, as I may say, a fresh brand and a different rate, I take my stand on the two obstacles, soil and climate, and maintain, being as they are, you cannot cultivate profitably exotic cotton in the N. W. Provinces. Even if you could get over the unsuitability of the soil, you still have the climate with its excessive rains at the end of September, and its frosts in the beginning of November—the former bound to produce bug, the latter to prevent the ripening of the pod.

"I began my experiments in 1865 with the New Orleans seed acclimatised at Dharwar. I cultivated it in accordance with rules which I believe I obtained from Mr. Ricketts, the then Collector of Allahabad, but which at any rate he published in English, Hindi, and Urdu, and which were circulated by the Board of Revenue, N. W. Provinces, in May 1866. The principle of them was, the seeds should be sown at a distance of 4½ feet apart. It was to be sown in trenches for the purpose of giving it water, and the plant, when it grew to 15 inches, was to be earthed up, so that in a short time the plants instead of being in a trench were on a ridge. Finally, when they attained the height of three feet they were to be topped so as to force out the lateral branches. With the means at my disposal, in the way of irrigation and labour, I was enabled to grow the crop successfully, that is to say, to bring the plants into full bearing. Samples of this cotton were sent to some of the principal brokers in Calcutta, and their unanimous opinion fixed its value at 50 per cent. above 'fair' Bengal, but this was coupled with the condition of not less than 1,000 bales. The crop was a very fair one, and the rain-fall just suited it. We picked in all about three maunds of *kapas* to the beegah, or about one maund of clean cotton between the last fall of rain in October, and the first frost in the end of November; but we had to irrigate it, and so far the difference in cost between the cultivation of this cotton and the indigenous cotton was the extra manuring, two extra weedings, and two flushings of water. There were, however, these drawbacks,—whatever cotton bloomed before the rains left off, got an insect into the pod which destroyed it, and the first frost, although very slight, quite shrivelled the remaining pods and put an end to the picking, so that the plants did not bring to maturity half the cotton they ought to have done. The supporters of the New Orleans variety claim for it the advantage of a perennial. In January 1866, the plant was accordingly cut down, and by dint of incessant watering and weeding, bore again in the end of May, but before anything like a picking had taken place, the rain came down and put an end to it. The only thing then to be done was to cut the plant in and trust to the autumn picking. This was done with pretty much the same result as in the previous year. In December 1866, we cut the plant back, but notwithstanding very free waterings, it did not shoot a bit sooner, and our May pickings met with exactly the same fate as in the previous year. The rains of 1867 were very excessive, and the result was, the plant all run to wood, got blighted, and hardly flowered at all. In the spring of 1868 we did not irrigate, and left the plants alone and only cut them in the beginning of the rains; the result of this was a comparatively fair crop in the autumn. To sum up all, we got three partial crops in four years, after going to an enormous expense in manuring, weeding, and irrigation; irrigating, moreover, in the end of October and the beginning of November, a season of the year when no ordinary cultivator can either spare the time or the water from his cold season crop. The produce was undoubtedly far superior to the indigenous cotton; but with the cost of cultivation, including the constant watering which the soil of this climate requires, and the frosts nipping in the bud the greater portion of [illegible] cultivation [illegible]

"In 1867, through the [illegible] of Messrs. Graham and Co., [illegible] varieties of cotton—Egyptian, [illegible], Brazilian, and Venezuelan. [illegible] plan, and in the hopes of bringing the plants [illegible] an earlier season of the year, so as to ripen off their [illegible] the November frosts came in, we planted in May, with the aid of irrigation. The seeds all germinated, but the plants would not make any growth to speak of until the rains fell, and we then found that seeds dibbled in to fill up vacancies, caught up the plants sown a month earlier, and were very much stronger and healthier. The New Orleans and Sea Island grew and flowered in the same way that the acclimatised seed from Dharwar had done, and had it not been for the excessive rain that year, we might have had a good crop. The Sea Island I don't think would have produced anything of any quality; what there was, was very weak in staple, though very long; the pods were small, and though the plants grew and thrived, still even the following year they did not produce a stronger article. As for the South American cottons, they none of them showed the slightest intention of flowering until the following year, *i. e.*, until the plants were ten feet high and eighteen months old, and then flowered very sparingly, although nothing could have been healthier than the plants. I entirely condemn the South American cottons as unsuited to the country. The plant exhausts the soil excessively, and no cultivator could possibly be kept out of his return for eighteen months, seeing that the Government revenue would fall due three times during that period. The Egyptian cotton I look upon as on a par with the New Orleans—doubtless adapted to some climates such as are to be found on the Bombay coast or in the Deccan, but quite unsuited to the North-Western Provinces.

"I am afraid the history of my experiments is very much a history of failures, and indeed I could continue to tell of further failures, after these exotic cottons were picked. It was found no native churka would separate the cotton from the seed; the saw-gin kindly lent me by the Agri-Horticultural Society of India cut the cotton all to pieces, and the only gin which would clean it was one of Macarthy's roller gins lent me by the firm of Hamilton, Brown and Co., but which was far too expensive to be worked in any small establishment.

"I now come to my experiments in cultivating Hingunghat and the indigenous cotton in 1870. I selected a piece of ordinary light soil termed domut, and cultivated it with one of Howard's light one-horse ploughs. Both the indigenous and the Hingunghat seed germinated freely, and there could hardly have been a more favourable season for it. The seed was sown broadcast, native fashion, the object being to ascertain what would be the result if the Hingunghat seed was distributed amongst the cultivators to treat it after their own fashion. The plants of both kinds grew to upwards of five feet in height, but here the similitude ceased. The country cotton began to flower profusely in the end of September, and though some little injury occurred to it from the rains in the end of October, it has on the whole produced a good crop of very superior quality. The Hingunghat cotton, however, on the other hand, showed no signs of flowering until November, and as fast as the bolls were formed, they were withered by the frost.

"The previous year, 1869, a gentleman in the same station cultivated about a beegah of the same quality of land, and sowed seed which he procured from his firm at Hingunghat with even worse result than my experiment. For the plant, although it grew luxuriantly, never flowered, and the cold weather setting in, the frosts effectually prevented any further vegetation. I believe the plant did not flower owing to the rains of 1869 leaving off much earlier than in 1870. I distributed the Hingunghat seed to a great number of cultivators this year, of whom some thirty have been so far successful that they brought the plant to maturity, but with identically the same result as myself. In the only two villages in which a moderate success was attained, the soil approaches to the nature of what is called 'black soil.' The fact is, the comparatively extreme cold of November, coupled with the dryness of the atmosphere and the unsuitability of the soil, without an immense amount of irrigation, combine to condemn the Hingunghat as well as other tropical cottons for these provinces. It might be possible, by sowing the seed early in the year, and with constant irrigation, to bring it so far forward as to complete its maturity before the setting in of the cold weather, and whilst the atmosphere still retains some moisture in it, but financially it would not pay. The cost of cultivating and irrigating for the two months before the rains, would absorb more than the increased value of the out-turn.

"Of course, cultivating as I did, if I was to add to the cost of expensive supervision, I need not say pecuniarily, I should have been considerably out of pocket. But even if one takes the present bazaar rate of cotton, Rs. 13 per maund, and

[illegible] to [illegible]

	Rs.	a.	p.
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible] women [illegible] from ten to fifteen [illegible]	1	0	0
	Rs. 10	[illegible]	

PRODUCE.

	Rs.	a.	p.	Rs.	a.	p.
Thirty-five seers of cleaned cotton, valued at Rs. 13	11	6	0			
Seventy seers cotton seed	1	12	0			
				13	2	0
Balance				2	7	0
or Rs. [illegible] an acre						

"We will now add 25 per cent. on the value of the out-turn, and the result is Rs. 7-7-4 per acre. But out of this he will have to pay for irrigation Rs. 2-0 per acre if he uses canal water, and it is generally supposed a good deal more if he relies on wells, to say nothing of the extra expense attendant on cultivation in the season. I think, therefore, the native is wise in his generation, in that he does not accept off-hand our problematical successes, and is content by the aid of a mixture of other crops, to pay his way, making a small profit in his own fashion, and teaching us, his would-be teachers, how, by the aid of *jowar* or *urhur*, to protect our cotton from being blown to the four winds, and to a certain extent from frosts.

"The above calculations are based on a price of Rs. 13 per maund of 82 lbs. of country cotton—a price beyond which many think N. W. P. cotton will hardly rise again. In the circular of the London Cotton Brokers' Association, for the week ending April 27th, I find the following quotation:—

	Ord. to Mid. per lb.	Mid. Fair.	Fair to Good Fair.	Good to Fair.
Bengal	3¾—4d.	4¼d.	5¼—5¾d.	6¼d.

"Notwithstanding Mr. Humes' memorandum on the expenses attendant on the purchase and shipment of Indian cotton, which the then Secretary of the Board of Revenue criticised very freely, and both of which papers the Board of Revenue published, at the same time declaring themselves not responsible for the opinions of the authors, American cotton has, *inhumanely* speaking, come again to the *status quo* of 1858, has again regained the supremacy in the English cotton market it once enjoyed, and good up-country cotton has, notwithstanding the diffident prediction of the Collector of Etawah, fallen below 6½d. a lb. in less than seven years since he wrote his memorandum.

"At the present rates the rules of supply and demand will come into force, and a diminished area of cultivation will show that the natives of India have an intuitive knowledge of those rules contrary to the expectations of many who have been for some years trying to enlighten them on the subject. The out-turn of next season will tell what advantage the country has derived from the expenditure of the Cotton Department, and the Board of Revenue will find that there remains not a seed of a seed of the maunds they have distributed to those ignorant and ungrateful natives,—ignorant in declining to adopt our views of cultivation, founded as they are on unfulfilled expectation; and ungrateful in feeding their cattle on the seed given to them by a paternal Government, instinctively knowing they could not cultivate it profitably. That there is some excuse for their ignorance, I venture to think, will be apparent from a perusal of the report from the Secretary of the Board of Revenue to the Government, dated 26th July 1869. In this the Bulundshuhur Collector reports that one Syud Meerbhan Ali sowed 1 acre, 1 rood, and 20 poles on the 12th July, with Hingunghat seed, and got the enormous out-turn of three maunds and ten seers of cleaned cotton. This cotton is stated to be whiter and finer than native cotton, *but the produce much less!* I have always understood that a maund and a half of cleaned country cotton per acre was a very handsome out-turn. As, however, this gentleman watered the lands, and this was the year when the periodical rains totally failed, one cannot wonder at abnormal results. Mr. Robertson, in the same district, pursuing the same system as to water, gets six seers of cleaned cotton out of nearly the same area as Meerbhan Ali. This is clearly a case which neither native or European is expected to understand. At Moradabad the experiment on one acre resulted in thirty seers, we are not told whether kupas or cleaned cotton; but from the value given—six rupees—one can only conclude kupas is meant, cleaned cotton being at that time worth Rs. 15 a maund in the Moradabad bazaar. At Mynpoorie [illegible]

[illegible] cleaned cotton; [illegible] land [illegible] in an [illegible] of cleaned cotton, [illegible] of country cotton. [illegible] is said to have [illegible] the curious process of transplanting after the plants were eight inches high, which general native experience would condemn on account of the long tap root of the cotton plant. Unfortunately he has not told us what the percentage of mortality among the plants was, nor what the area sown or actual out-turn from which he gets the result of 270 lbs. of cleaned cotton. It will be observed he planted out his crop at still greater distances apart than either Mr. Login or Mr. Ricketts recommend. It would be interesting to know what result the next year gave, for I conclude, with such a favourable out-turn he did not abandon the experiment.

"I have seen a proposal by a Lieutenant Pogson to acclimatise the seed in the Himalayas, and then distribute it through the plains; with my experience of the action of frost on the plants, I confess I am doubtful of the result. As, however, he proposed to try the experiment in 1870, and Mr. Carnac expressed his readiness to supply the seed, I should be very glad if his problematical success had been realised to an actual one.

"If we turn to the Board's report for 1869-70, we find that heavy rain destroyed all experiments, and the only detailed report I have come upon is the Bulundshuhur experimental farm. The first thing which strikes one is why the cotton cultivation, beginning as it did in the end of June or beginning of July, was so dependent on canal irrigation. It is notorious all over the North-West Provinces that cotton is sown after the first fall of rain has sufficiently softened the ground to enable the plough to get into it. I need only mention the Bundelcund cotton, the finest quality grown in the North-West, as an instance of how independent the country cotton is made to be of artificial irrigation; if in the Bulundshuhur district the cotton is sown by means of artificial irrigation, it is exceptional, and adds an additional charge to the cost of cultivation which present rates will hardly justify.

"It is not stated exactly when the first sowings were made, but I gather from the context, in the end of June or beginning of July. As the periodical rains never make their appearance in the N. W. Provinces before the end of June, I cannot admit there was any such delay, so far as regards the country seeds, as would have prevented its yielding an average crop.

"I find the areas sown and yield in uncleaned cotton or kupas of country seeds, as follows:—

Beeghas.	Biswas.	Kupas. Mds.	Kupas. Srs.
[illegible]	10	0	10
[illegible]	14	0	[illegible]
3	10	0	33
2	17	0	[illegible]
4	0	3	0
3	7	1	[illegible]
3	9	4	0
19	14	[illegible]	30

averaging 21·64 seers per beegah, the out-turn from which in cleaned cotton would be 7·21 seers.

"If we cannot grow the common staple of the country as successfully as the native—I don't say as economically—we can hardly expect them to adopt our agricultural views. I find, too, more land was taken up towards the end of July and more seed sent for from the Central Provinces. I am certain there is not a native in Bulundshuhur who would not have predicted failure for such experiments so late in the season.

"There appears also to have been a misapprehension as to the varieties of cotton cultivated there. I am under the impression that Hingunghat is a generic term for both Jarri and Bani cotton. The Jarri cotton, though not actually grown at Hingunghat, but chiefly in the Chanda district (and is hardly a cotton worth transplanting, as it is described as very weak and thin in staple), is, as its name betokens, a cold season crop, being sown after the rains and picked in May and June. Being however brought to the Hingunghat mart it is usually called—as well as the Bani cotton—by the generic name of Hingunghat cotton. Bani is the cotton grown in the district of Hingunghat, sown at the beginning of the rains and picked in December. It would therefore have been more correct if the Bulundshuhur farm had dropped the title Hingunghat altogether. I only mention this as we are all engaged in trying to teach those stupid natives, and it is just possible they may remark our inaccuracy.

"The last publication of the Government of India on the subject of cotton is Mr. Login's report on his experiment. Mr. Login began upon fallow lands, which as it grew grass was probably fairly fertile in itself; the many years rest it had, had left it in a condition to put forth all its latent strength when cultivated. He proceeds to detail a method of cultivation which,

as I have before shown, has long been tried and known in this part of India. He states he planted his seed two feet apart, on ridges three feet apart, and yet subsequently talks of plants covering fifteen to twenty square feet; and as a climax, he advocates this—as he calls—Egyptian method of cultivation, because he says you might grow cold weather crops between the ridges, the said ridges being only three feet apart and having on them shrubs covering twenty square feet. He states his experiment was a partial failure, owing to inundation from the rain. I rather suspect a native cultivator would have hardly selected a spot liable to inundation for any crop he was particularly anxious about. Any way, I submit the growing plants, covering twenty feet square in an area of six square feet, and then proposing to grow a winter crop between the ridges, is another of those wonders which neither native or European can be expected to understand, and must be excused if they do not accept his results, until the theory has been reduced to practise on a much larger scale. The truth is, the publication of all these theoretical successes do no good whatever to the country. They certainly, so long as Manchester was suffering from dear cotton, had the effect of making her believe the Government of India was exerting itself. But, now that she has Upland and New Orleans middling, at 6d. to 7½d. per lb., her interest in Indian cotton cannot be expected to last, and we ought to set our shoulders to the wheel—not to begin by teaching the cultivators, but by gathering from their experience and endeavouring by the aid of our science to see if we can improve upon what, as far as it goes, is undoubtedly good. I may say the publication of all these reports does no more good than the distribution of the tons of seed by the Government during the past six years. There is no result from either, nor will there be until we can prove ourselves really the masters in agriculture we profess to be. My own impression—an impression gained from a long practical experience in agriculture—is that we who have not had a scientific agricultural education can learn almost more from an intelligent cultivator than we can teach him; but as I propose to give you my views under this head shortly, I will not touch on the subject now.

"After all I have written with reference to the past, it is not to be supposed that I am against further experiments. I am sanguine enough to expect that much may be done towards improving the indigenous cotton. I propose myself to try this year the ridge-and-furrow system with and without artificial manure—a plan I have hitherto only tried with exotic cotton—and I expect much from selection of seed. But having given every kind of exotic cotton a fair trial, I look upon any further experiments in that line in this part of the country as simple waste of money. We cannot make a moist climate, we cannot prevent the effects of frost, though something might be done to remedy the defects of soil; but the two above-mentioned desiderata being the *sine qua non* of exotic cotton cultivation, all that remains to be done is to give it up and try what can be done to improve the indigenous article."

The Foresters' Gazette.

BOMBAY, 21st September 1871.

No. 129.—The following rules drawn up under Act VII. of 1865, have been confirmed by the Viceroy and Governor-General in Council, and are, in accordance with Section 6 of that Act, published in the *Gazette of India* :—

Rules for the better management and preservation of the Government Forests in Coorg.

I.—The following rules are published for the administration of such Government forests in the Province of Coorg as have been defined in Notification No. 127 of the 10th of August instant.

II.—The administration of these forests will be vested in the following officers :—

(a.)—The Conservator of Forests, his Assistants, and the subordinate forest officers.

(b.)—The Superintendent of Coorg, and the subordinate Revenue officers. It will also be the duty of all Police officers to watch over the observance of these rules, and to afford every assistance to the forest officers in the exercise of their duties.

III.—The boundaries of Government forests will, wherever they do not run along a road or stream, or other well defined line, be demarcated by cleared boundary paths and permanent boundary marks. Wherever practicable, the boundary lines of Government forests and the boundary marks should be entered on maps which should be prepared in triplicate; one copy to be sent to the Conservator of Forests, one copy to remain with the forest officer in charge of the division, the other to be deposited in the office of the Superintendent of Coorg. In special cases, the Chief Commissioner of Coorg may authorize the demarcation of [illegible] manner the Chief Commissioner [illegible] tion of the map showing the [illegible]

Proclamation of the [illegible] their boundaries will be [illegible] are situated, and posted to the [illegible]

IV.—In Government forests [illegible] without the order of the [illegible]

V.—The Government forests will remain under the control of the officers of the forest department. [illegible] felling, cutting, lopping, marking, or [illegible] of trees, shrubs or bamboos, or the collection of leaves, grass, [illegible] and other forest produce, the clearing of land for [illegible] the setting fire to grass or jungle, the grazing of cattle, or any act that is likely to damage the forests, is prohibited, and will be punished by fine not exceeding five hundred rupees, and in default of payment of such fine by imprisonment for such term as is provided in the 67th Section of the Indian Penal Code.

VI.—Existing roads or pathways through the Government forests may be used as far as is compatible with the conservancy of the forests; but the Conservator of Forests, with the concurrence of the Superintendent of the province, may close any existing roads or pathways through any Government forests, whenever he may deem it requisite to do so. Public notice of the closing of such a road shall be given in the taluk or taluks where the forest is situated.

Ingress to the Government forests without permission, except by authorized roads and footpaths, is prohibited. Any one found off the authorized roads and footpaths in the forests without authority, and owners of cattle straying in the forests, will be liable to a fine not exceeding two hundred and fifty rupees, and in default of payment of such fine, to imprisonment for such term as is prescribed in the 67th Section of the Indian Penal Code.

Cattle found straying in the forests may be pounded, and may be redeemed on payment of a sum of money according to a scale of rates to be laid down from time to time by the Chief Commissioner of Coorg, and in default of payment of such sum of money within a reasonable time, the cattle shall be sold on account of Government. It shall be lawful for the officer selling such cattle to award a portion of the proceeds of such sale, not exceeding one-half, to any person on whose information such cattle was seized. Such fines to be credited to the forest department.

VII.—There will be a subordinate forest officer in charge of every Government forest or part of a Government forest. He must reside within or in the immediate vicinity of the forest. He must be acquainted with every part of it, and with whatsoever happens therein. He will be responsible for the maintenance of the boundary lines and boundary marks.

In cases of unauthorised felling and other breaches of the forest rules, he must immediately report the occurrence.

It will further be his duty by all means in his power to prevent the continuance or repetition of the acts constituting the breach. He will seize all wood or other forest produce unlawfully cut or removed, which he may find within the limits of the forest.

He will use every lawful means for the defence of the property entrusted to his charge.

He will be held responsible that no trees, except those marked by the Conservator or his assistants, are felled.

VIII.—No forest officer shall engage in any employment or office whatsoever other than his duties under these rules, unless expressly permitted to do so in writing by the Chief Commissioner of Coorg.

IX.—All drift and unclaimed timber and bamboos within the Province of Coorg, will be considered the property of Government, unless proof of ownership be given as hereinafter provided. Drift timber and bamboos shall be collected at such stations as the Conservator of Forests may direct, and notices shall from time to time be published, stating the number and description of pieces of drift timber and bamboos collected at such stations.

X.—Not less than two months' notice will be given for the reception of claims to the ownership of drift and unclaimed timber or bamboos, after which no claims will be allowed, and the timber and bamboos will be sold on account of Government.

XI.—All such claims will be settled by the Conservator, or by such officer as he may authorize; provided, however, that he shall be at liberty to decline arbitrating regarding such timber or bamboos, and, in case he may see fit to do so, refer claimants to the Civil Courts.

XII. Timber or bamboos awarded to claimants must be redeemed by the payment of salvage and other expenses which may have been incurred on account of such timber.

XIII.—It is the duty of the officers and subordinates of the forest department, and of all revenue and police officers, to see that these rules are not violated, and should they, in any case, be infringed, to report the same without delay to the nearest

Magistrate or forest officer in charge of the range; and it shall [illegible]

XIV. [illegible] provisions of these rules [illegible] provided, or any [illegible] the military magistrate [illegible] shall be liable to be prosecuted for such [illegible] of the Indian Penal Code. [illegible] the government involves fraud or theft, or any [illegible] Penal Code, the offender will be [illegible] prosecuted against under the provisions of the Penal Code.

XV.—Any axe, [illegible], knife, hoe, or other tools, vehicles, or implements, or also all cattle and domestic animals, used in any such transaction as offence against these rules, and all timber which has been marked or obtained in a manner contrary to these rules, whether entire or cut up, or sawn up, may be seized by any officer of the forest department, or police officer; and such timber, tools, vehicles, implements, cattle and domestic animals, may be confiscated or released on payment of a fine by the orders of the Magistrate of the district, or of such Magistrate, Subordinate Magistrate, or forest officer vested with any of the powers of a Magistrate, as may be specially empowered by the Chief Commissioner to exercise jurisdiction under these rules.

XVI.—Offences against these rules may be tried and determined by the Magistrate of the district, or by such Magistrate, Subordinate Magistrate, or forest officer vested with any of the powers of a Magistrate, as may be specially empowered by the Chief Commissioner to exercise jurisdiction under these rules, provided that Magistrates, Subordinate Magistrates, or forest officers, vested with the powers of a Magistrate, shall not exceed their respective powers as defined in Section 32 of the Code of Criminal Procedure.

XVII.—The Chief Commissioner may invest the Conservator, Deputy Conservator, or any Assistant Conservator of Forests who may be qualified, with the powers of a Magistrate or of a Subordinate Magistrate under these rules.

XVIII.—The Chief Commissioner of Coorg shall be at liberty to frame rules and revise such rules from time to time as shall be necessary for the sale by auction or otherwise of sandal-wood, timber, or any other forest product, produced in the Government forest. Such rules shall be binding on all purchasers, and any breach in their observance shall render the offender liable, on conviction, to the penalties detailed in Sections 14 and 15 of these rules.

Official Gazette.

BOMBAY, 21st SEPTEMBER 1871.

EXPERIMENTAL FARM—MADRAS.

ANNUAL REPORT OF THE MANAGEMENT OF THE GOVERNMENT FARM ESTATE, FOR THE YEAR ENDING 31st MARCH 1871.

(Continued from our last.)

Chinese Sugar-cane.

This is the true "sorghum saccharatum;" it is a millet, and in habit of growth and in general appearance resembles the cholum of this country.

The seed was obtained from Sydney.

The soil having been cultivated as for cholum was sown on the 10th of October 1870. The total area of the piece of land selected was 2,434 yards, and the seed used weighed ten pounds.

The seed was sown in drills, about two feet apart. It germinated very slowly, and took at least double the time required by cholum in coming through the ground. However, the crop was regular, and the plants healthy.

When about four inches in height, a portion of ground was divided into plots, each containing 1/128th of an acre, and different manurial top-dressings were applied.

The Peruvian guano used was an inferior sample; it contained a very small percentage of ammoniacal salts. The other manures were such as are procurable in this district, and the prices charged are the prices actually paid. The carbonate of lime was powdered shell chunam. All the applications were reduced to a powder before being used; they are all mixed with sand, in order that they should be equally distributed over the ground. A quiet morning was selected for sowing the manure; a drill cultivator followed immediately behind the sower and covered the manure. The crop was grown entirely under dry cultivation; it grew well, and had at all times a promising appearance.

The [illegible] manure received two or three times during the crop, [illegible] and this was all the attention it received.

In the early growth the plots, [illegible] very little, were [illegible] the time when the [illegible] to harden. It is at this stage that it is usual in [illegible] days the crop for the purpose of extracting the sugar. Harvesting commenced on the 25th of January; the following are the results:—

Actual Results.

No. of Plot.	Area of Plots.	Manure used.	Value of Manure.	Yield of Grain.		Yield of Straw.
				Weight.	Measure.	
	Square Yards.		Rs. a. p.	lbs.	M. Mrs.	lbs.
1	[illegible]	12 lbs. of guano	[illegible]	[illegible]	[illegible]	1,[illegible]
2	[illegible]	150 " of carbonate of lime	[illegible]	[illegible]	[illegible]	1,[illegible]
3	[illegible]	10 " of saltpetre	[illegible]	[illegible]	[illegible]	1,[illegible]
4	[illegible]	Nothing	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	37 lbs. of bone dust	[illegible]	[illegible]	[illegible]	1,[illegible]
6	[illegible]	112 " of sulphate of lime	[illegible]	[illegible]	[illegible]	1,[illegible]
7	[illegible]	12 " of guano	[illegible]	[illegible]	[illegible]	1,[illegible]
8	[illegible]	150 " of carbonate of lime	[illegible]	[illegible]	[illegible]	1,[illegible]
9	[illegible]	10 " of saltpetre	[illegible]	[illegible]	[illegible]	1,[illegible]
10	[illegible]	Nothing	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	37 lbs. of bone dust	[illegible]	[illegible]	[illegible]	1,[illegible]
12	[illegible]	112 " of sulphate of lime	[illegible]	[illegible]	[illegible]	1,[illegible]

Average Results.

Manure.	Yield.		Increase due to Manure.	
	Grain.	Straw.	Grain.	Straw.
	lbs.	lbs.	lbs.	lbs.
Unmanured	[illegible]	[illegible]		
12 lbs. of guano	[illegible]	1,[illegible]	[illegible]	[illegible]
150 " of carbonate of lime	[illegible]	1,[illegible]	[illegible]	[illegible]
10 " of saltpetre	[illegible]	1,[illegible]	[illegible]	[illegible]
37 " of bone dust	[illegible]	1,[illegible]	[illegible]	[illegible]
112 " of sulphate of lime	[illegible]	1,[illegible]	[illegible]	173

Financial Results per Acre.

	Increase due to Manure.		Value of Increase per acre.	Profit.
	Grain.	Straw.		
15 Rupees per acre expended on—	lbs.	lbs.	Rs. a. p.	Rs. a. p.
Guano	[illegible]	[illegible]	[illegible]	[illegible]
Carbonate of lime	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre	[illegible]	[illegible]	[illegible]	[illegible]
Bone dust	[illegible]	[illegible]	[illegible]	[illegible]
Sulphate of lime	[illegible]	[illegible]	[illegible]	[illegible]

In the above calculations, the straw was valued at 5 rupees per ton, a low price; and the grain at the rate of thirty pounds per rupee, also a very low price; we bought the seed in Sydney last season at the rate of four pounds per rupee, the usual price in Australia for this seed, and our sample is much superior.

It is gratifying to find that saltpetre (nitrate of potash), an indigenous product, has given the best results. An expenditure of 15 rupees per acre on this manure having not only nearly doubled the crop, but, after repaying its own cost, left an additional farmer's profit of nearly 30 rupees per acre. The value of saltpetre has long been recognised in England; but its great cost in that country has prevented its general use. Nitrogen is always more acceptable to plants in the form of nitrate than in ammonia. Nitrate of soda is very largely used in England, and so also would nitrate of potash (saltpetre) be much used, if it could be obtained at the price at which most farmers in this country can procure it. This salt is best applied as a top-dressing when the crop is a few inches above the ground: 100 pounds or at most 150 pounds per acre is enough to apply: it should always be mixed with an equal volume of sand or some similar material, in order that it may be more regularly distributed over the ground. Bone dust stands second in my list; probably, if the continued effects of each be considered, it should stand first. Next comes carbonate of lime (chunam). An expenditure of 15 rupees on lime was not only repaid by the increase in the crop, but a profit of nearly 30 rupees was added. Sulphate of lime (gypsum) comes next; this also not only repaid its original cost, but left an additional profit of nearly 15 rupees per acre. The guano repaid its cost, but only left a profit of about 6 rupees per acre. As I have already stated, the guano was inferior; still I think there are other reasons for the small return it gave. I use the words "small" return merely in comparison with the foregoing results. A surplus of 6 rupees per acre over the cost of any manure is far from being an unsatisfactory profit. Until I have made further experiments, I would not like to speak with any

degree of certainty; still I am much inclined to believe that the nitrogen, presented as it would be in the form of ammonia, was of very little value to the plant, and that whatever efficacy the guano possessed, must be attributed to its phosphates and potash. It must not be taken for granted that because saltpetre and the salts of lime produced such good results on our soils, they will necessarily produce as good results on other soils; for if a soil is rich in lime or potash it will not benefit it greatly to apply either; though there are few soils under cultivation that will not repay the cost of either, still these results indicate the kind of food most acceptable to the cholum tribe. Each farmer should experiment, and thus ascertain for himself the wants of his soil.

The fodder is very valuable; all kinds of stock are extremely fond of it; it is quite unnecessary to chaff the straw; both the cattle and sheep eat every particle placed before them. It is rather difficult to keep it from the attack of ants, its extreme sweetness rendering it very attractive to them.

After removing the crop I had the stubble watered and manured, and there is now a fair second crop. But to secure the largest quantity of fodder, the crop should be cut at an earlier stage than in the instances under review. We cannot hope to obtain both the maximum quantity of fodder and the maximum quantity of grain. If we obtain a large yield of the one, we must be content with a lesser yield of the other.

Chumba Paddy.

Two plots, each containing one-fifth of an acre, were prepared in the usual manner for paddy. One was manured with twelve loads of yercum plants (calotropis gigantea), the manure was worked into the puddle, and after fermentation had taken place, the land was ploughed up twice or thrice until all the bad smelling gases had been driven off. It was then, on October 5th, sown broad-cast with four measures of chumba paddy. The crop grew satisfactorily, and was reaped on the 2nd of January, when it yielded 182 measures or 409 pounds of grain, equal to 910 measures or 41 bushels per acre.

The other plot was similarly prepared. It was manured with ten loads of foldyard manure. This manure was worked into the puddle in the same manner as the yercum leaves in the foregoing experiment. Four measures of seed was sown broad-cast over the land on the 5th October. The crop was harvested on the 2nd of February, and yielded 160 measures or 375 pounds of grain, equal to 800 measures or 36 bushels per acre.

Green Gram ("Phaseolus Mungo").

A piece of land measuring about half an acre was sown with twelve pounds of green gram on the 26th of October. The seed was sown in lines about twenty-two inches apart. The drill cultivator was passed along between the drills two or three times during the early growth of the crop; this not only kept down the weeds, but prevented the soil from cracking and becoming "hide-bound." The crop grew vigorously, and produced at least twice as much leaf as is usually produced by the horse gram. I did not ascertain the feeding value of its fodder, being anxious to test its grain-producing qualities; but I propose next season to grow it as a fodder crop, and to determine its value in feeding stock. That stock will eat it freely I have already ascertained. The crop was harvested on the 26th of February, and yielded 10 mercals, or 240 pounds of seed. This, at the present market price eight measures per rupee, would give 10 rupees (or 20 rupees per acre) as the value of the grain. As during the ripening process, the greater portion of its leaves fall upon the ground, it must add considerably to the fertility of the soil, seeing that its leaves, like the leaves of all leguminous plants, absorb from the atmosphere a large quantity of ammoniacal gases. The straw, when the plant is allowed to mature its seed, is not of much value. Green gram will make a useful plant in a rotation. Not only is it a remunerative crop to grow, but it restores ammoniacal matter to the soil, and allows of the ground being tilled and cleaned during its growth.

Gingelly ("Sesamum Indicum").

Four measures of gingelly seed were sown on the 29th of June on a well-prepared piece of land, measuring 7,700 square yards. The seed was sown in drills about twenty inches apart.

The crop grew very satisfactorily, and would have returned a very large yield of seed had it not been for the very heavy rains that fell while the plant was in full flower.

Harvesting was commenced on the 11th of September. The out-turn of grain amounted to 913 pounds.

Another plot measuring 4,306 square yards was sown with two-and-a-half measures on the 16th of June. The crop was harvested on the 23rd of September, and yielded 763 pounds of grain.

Castor Oil Plant.

A piece of land, measuring two-fifths of an acre, was ploughed and manured with a small quantity of foldyard manure in July last. It was sown in the same month with one-and-a-half measure of castor oil seed. The seed was sown in drills about twenty-four inches apart.

The plants now [illegible] of seed up to this [illegible] market price, fetched [illegible]

Horse Gram ("Dolichos Uniflorus").

A considerable area of land [illegible] a "Catch Crop," and [illegible] The crop has proved a valuable [illegible] cold weather crop [illegible] opportunity for growing a crop of [illegible] cultivating season. [illegible] take a crop of green fodder [illegible] sowing our regular cold weather crops. The crops [illegible] chumba, &c., sown in October will be harvested [illegible] part of February, thus affording plenty of time for [illegible] gram crop before the hot weather sets in. Our practice is immediately after the removal of the crop, to plough up the stubble, collect weeds, &c., and sow the grain as close behind the plough as possible, and to harrow and roll immediately afterwards; the great object being to keep the moisture in the land. At this late season rain seldom falls, and if the land be allowed to lose its moisture, either by the ploughing being delayed too long after the removal of the previous crop, or by delaying the sowing and after-operations when the land is ploughed, it will be useless to expect a crop. I have known grain remain for months in the ground, without germinating, simply from carelessness in allowing the moisture of the soil to escape. If, in an ordinary season, the crop gets above the ground before the end of February, even though there be no rain during the next six weeks, the dews will suffice to bring it forward.

We had, on March 31st, a considerable area of crop sown after the removal of the regular crop, which promised to yield a very fair return of fodder—no unimportant matter at that season of the year, when scarcely a green blade of grass can be found on the pastures. I have found this late crop of gram fodder invaluable for the ewes and lambs. They are very fond of it, and its succulent and nutritive character greatly adds to the quantity and quality of the ewes' milk.

Hurrialles Grass.

The old "Hurrialles Meadow," which measures three acres, gave five cuttings during the past year, yielding eight tons thirteen cwts. of hay. Excepting about fifty square yards, watered for experimental purposes, the meadow was solely watered by the rain-fall. As it is proposed to do away with this meadow, and to plant the grass on a lower level, I applied no manure whatever. Ten rupees would repay every other expense incurred on behalf of this meadow.

The hay was sold for rupees 390-13-6, and the cost of cutting, raking, &c., was rupees 105, leaving a profit of rupees 85-4-1 per acre. To this may fairly be added 5 rupees per acre for grazing during the dry season.

I am glad to have to record that the grass is gradually becoming less aquatic in its character, and that I have hopes of establishing it ere long as a "dry" crop, independent of artificial irrigation.

The grass will be carefully removed to a more suitable situation during next wet season, and will be planted with the plough in the same manner that beans are planted in some parts of Scotland. I put down two acres in this manner a few months ago; we have had very little rain since the grass was planted, so the crop has not made much progress; I am, however, quite satisfied with its present appearance, and feel sure that after it has enjoyed a monsoon, it will be regularly established. The cost of planting was very trifling, not more than one-tenth of the usual cost. The land having been well cleaned, received a dressing of about five tons per acre of foldyard manure; when ploughing in the manure a woman followed each plough and dropped the grass roots in the open furrow, these the succeeding plough covered up, when its furrow was similarly planted, and the process repeated; a heavy harrowing and rolling completed the work.

Being anxious to see what amount of work our coolies really could do with our improved grass knives in cutting hurrialles grass, I offered three small prizes for "quick and good work." The ground selected was laid out in the usual [illegible] and the crop was very similar. Fifteen coolies entered for competition, each plot contained 120 square yards. The following are the results:—

	Time occupied. Minutes.		Time occupied. Minutes.
1st Man	115	[illegible]	124
2nd do.	117	[illegible]	128
3rd do.	118	[illegible]	[illegible]
4th do.	119	[illegible]	[illegible]
5th do.	[illegible]	[illegible]	[illegible]
6th do.	[illegible]	[illegible]	[illegible]
7th do.	[illegible]	[illegible]	[illegible]
8th do.	130	[illegible]	[illegible]

The work was fairly done; however, the labourers worked at a much greater speed than they could continue at during a whole day. The great stress which they can do under extraordinary circumstances. The average time required to complete the work was 132 minutes, at this rate eleven men should cut an acre per day. My experience is that it usually takes nearly twice this number. Formerly, when the common country hooks were used, it was considered that forty men did a fair day's work if they cut one kure per day. The competition took place early in the morning while the men were fresh, and before the heat of the sun became unpleasant, so the results obtained cannot be taken as *average* results. Probably fifty per cent. added would more nearly represent a fair day's work. Though it is certainly a great step in advance to cut an acre of grass on land divided under these troublesome beds by sixteen men in one day at a cost of 3 rupees, I cannot look upon the result as anything like what we ought to attain. In England three and six pence to four shillings per acre is a fair price to pay for cutting meadow hay; this is equivalent to the pay of two average field labourers, and here we are content if we get the same work done by sixteen field labourers. The fault is not so much with the men as with the system; as long as hurriallee grass is grown in these wretched little beds, we cannot hope to reduce greatly the cost of cutting. If we can succeed in growing as good crops on a surface where the scythe can be used, I have no doubt but that the cost of cutting could be reduced to twelve annas, or at the most one rupee per acre.

Hurriallee, like most other meadow grasses, should be cut immediately the flower begins to appear; at this state the juices of the grass are more nutritious, and the hay is far superior than when made from the fully matured plant. Besides, when cut before the seed appears, the plant is more vigorous and produces another crop much sooner. Hurriallee hay is generally spoiled in this country by being too much exposed to the sun's rays. It is quite unnecessary to bleach the grass, in order to make it into hay. The great object should be to retain the green colour of the grass by drying it as quickly as possible. Under ordinary circumstances, two days, or at the most three days, should suffice for making the hay.

Cutting should not commence until the dew is off the grass. The grass should remain on the ground for an hour or so after being cut. It should then be turned and tossed until sunset. It cannot be tossed too much during a hot sun. To preserve the green colour and aroma of the hay, it is absolutely necessary to keep it moving. At night, if the dews are heavy, it should be put up in small cocks, each containing from two to three cwts. These cocks should not be trampled, though it is advisable to beat smooth the outside with the back of a rake, in order that should a shower of rain fall, the water may run off without penetrating the mass. A single hay rope should be passed over the cock, to prevent it from being blown to pieces by a gust of wind. Next morning, after the dew is off the ground, the cocks may be opened again, and the hay spread out. It must be tossed and turned again, as on the previous day; care being taken that it is constantly kept moving. At the end of the second day, under usual circumstances, it will be fit to cart; though if the weather be at all damp or foggy, it will be advisable to give it another day's sunning, of course putting it again into cock at night.

Hay thus rapidly made is rich in saccharine matters, and is, therefore, very liable to heat and ferment; this, to a moderate extent, does no harm; in fact it gives the hay a good flavour; however, care must be exercised that it does not go too far and char the hay. If the hay is loose in a room, exposure for an hour or two in the hot sun will put it all right, or a layer or two of dry paddy or cholum straw may be put through the mass. In the stack it is equally easy to prevent too great fermentation. I have found a single line of six-inch drain pipes placed at about the middle of the stack from the centre to the outside, a capital arrangement for keeping down the temperature. A thick bamboo, or a couple of hollow pieces of the stems of palmyra or cocoanut trees, the one resting on the other so as to form a pipe, will equally effect the purpose, or, in building, two or three layers of dry paddy or cholum straw, placed in the stack, will prevent it heating to an injurious extent.

Prairie Grass ("Bromus unioloides").

A small supply of American Prairie grass was obtained from Australia last season. A piece of good soil was suitably prepared for it, and the seed was sown in drills nine inches apart. Only a very small proportion of the seed germinated.

Though it is now nearly six months since the grass was sown, it is only about four or five inches in height. Care will be taken of the plants, and results carefully noted.

Perennial Rye Grass ("Lolium perenne.")

A plot of ground was sown with perennial rye grass obtained from Sydney. The seed was a good sample; it was sown on the 25th of October. The crop was some time in coming through the ground, and never grew satisfactorily. The ground was fairly covered, but the grass had always a sickly, unhealthy appearance. A few hot days scorched it so much, I saw that it was useless to continue the experiments longer, so had the crop ploughed in.

Flax.

A few pounds of Egyptian flax was sown on the 25th November. It grew very satisfactorily. It was cultivated as a dry crop, and matured its seed. The straw was not more than two-and-a-half feet in length; but the weather was unusually dry during its growth. I intend to try this crop on a larger scale next season.

Carolina Paddy.

This crop being no longer an experimental one, and the soils on this farm being very unfavourably situated for irrigation, I sent greater part of the imported seed to the Model Farm for trial.

We cannot afford to experiment on the "Model Farm," and the crop was therefore cultivated as an ordinary farm crop; in fact in the same manner as country paddy.

All the crops were transplanted from seed beds.

The first crop was sown in the nursery beds on the 6th of August, and was transplanted on the 6th of September. The ground occupied by the plants measured 1,800 square yards. The soil was not in good condition; the field had been recently levelled, the high parts had been reduced, and the hollows had been filled. The plants grew well where the ground had been raised, but very indifferently in the places where the top soil had been removed. Harvesting commenced on the 12th of December. The yield of grain was 157 Madras measures, equal to 630 pounds or 20 bushels per acre.

Another plot, measuring 2,027 square yards, was planted on the 7th and 8th of September with seedlings aged thirty days. The crop was harvested during the last week in December, and yielded 424 measures or 960 pounds of grain, equal to 1,012 measures or 46 bushels per acre.

A third plot, containing 2,650 square yards of land, was planted on the 16th of September with seedlings about twenty-four days old. The crop was harvested on the 24th of January, and yielded 488 measures or 1,120 pounds of grain, equal to 801 measures or 40 bushels per acre.

The grain was very good indeed; both the first and the second prizes for Carolina paddy at the Agri-Horticultural Society's Show, held in February last, were awarded to it.

A small experiment was made on this farm with seedlings aged forty days. I was anxious to ascertain whether, if planted out as old as this, fair results could be obtained; as when planted out at forty days old, instead of twenty-one days, we would save nearly three weeks' watering during the after-growth of the crop.

The plot measured one-fifth of an acre; it was well manured with fold-yard manure, puddled in in the usual manner. The seedlings were reduced to half their height, and planted in the puddle on the 22nd of September.

The crop was cut on the 3rd of December, and yielded 215 pounds of grain, equal to 1,075 pounds or 23 bushels per acre. The yield of grain is small; still, as the crop was watered only for about three months, instead of nearly four months, circumstances may arise which may make this practice worth adopting. The occasional watering of the few square yards (the seedlings for an acre occupy) in the nursery will not together amount to more than a single watering of the transplanted crop.

Buckwheat.

A bushel of this seed was obtained from Sydney, and a portion of it was sown on the 8th of October on a piece of suitable soil in fair condition. The crop grew and flowered; it never exceeded the height of six inches, and, as it promised to yield a poor return of seed, it was ploughed down.

Artichokes.

A plot of land, measuring about one-fifth of an acre, was ploughed and manured with four cart-loads of fold-yard manure, and, on the 23rd of August, was planted with thirty-five pounds of Artichokes. The sets were planted about a foot apart in drills. The crop was harvested on the 8th of February, and yielded 331 pounds of tubers.

Red Cholum.

A supply of red cholum was obtained from Salem. The grain is similar in size to yellow cholum, but is quite red.

On the 12th of October we sowed twenty-eight pounds in the same manner as we sow yellow cholum. It was reaped on the 14th of February, and yielded 270 pounds of very good seed. The return of straw was large; the crop was very tall and closely packed upon the ground. The result was satisfactory. The soil was good, and probably yellow cholum would have given a better return; still it is well not to be altogether dependent on one variety of cholum.

This is "the Cullarium" of the Australians. It is a variety

of sorghum, and is very similar to the sorghum vulgare, or white cholum of this district. Imphee is supposed to have been originally obtained from the south-eastern coast of Africa. In America it is by many considered a better sugar-producer than the Chinese sugar-cane, and all agree that its sugar is much more easy to crystalize. I obtained a few pounds of seed from Sydney, and sowed it on the 30th of November, but its growth was very unsatisfactory; it has not produced more than one-tenth of the crop the Chinese sugar-cane produced, while it requires a much longer time in coming to maturity. It is only now beginning to ripen. The canes are thick, but very short, and so far I cannot detect the presence of any more saccharine matter than is present in our common cholums. I intend to repeat the experiment again next season.

REPORT OF THE SUPERINTENDENT OF THE GOVERNMENT FARM ON THE CULTIVATION OF THE YELLOW CHOLUM.

Sorghum vulgare, or Yellow Cholum.

This is a beautiful grass, resembling in appearance Indian corn. It bears a small yellow seed, which, when crushed, makes a good auxiliary food for cattle or sheep. It grows on all kinds of cultivated soil, but best on those that are *thoroughly* cultivated and well manured. Indeed, few crops will pay better for *high cultivation*. This valuable plant has attracted a great deal of attention during the last few years, and has been highly recommended as a fodder-crop. It is best suited for cultivation in countries where the temperature seldom falls below 60 degrees. It will certainly grow in much colder climates, but scarcely pays expenses. A few years ago the cultivation of this crop was attempted in England, and, amongst other places, on the Experimental Farm attached to the Royal Agricultural College the yield of green food was insignificant, and its further cultivation was not deemed advisable. The experiment was, however, valuable in affording Dr. Voelcker an opportunity of analysing the crop during different stages of its growth. He found that the half-grown plant contained above two-and-a-half per cent. of flesh-forming matters, and about eleven per cent. of fat, as heat-producing matters. As the turnip is the sheet anchor of the stock-feeder at Home, we place its analysis alongside Dr. Voelcker's analysis of yellow cholum. A glance at those analyses will suffice to show the great value of yellow cholum-fodder as food for farm stock:

	Yellow Cholum.	*Turnip.*
	Per cent.	Per cent
Water	85·17	90·43
Flesh-forming matters	2 55	1·04
Fat or heat-producing matters	11 14	7·80
Inorganic matters	1·14	·64
	100·00	100·00

Dr. Voelcker found that in the half-grown plant there was little or no sugar; but when the plant was three-quarter grown, there was as much as 5·85 per cent. of sugar in the lower part of the plant. We have no analysis of Indian-grown plants; however, it may safely be inferred that if such a large amount of sugar was present in plants grown in a climate so ill-suited for the production of sugar as that of England, a very much larger quantity will be found in Indian-grown plants.

On the Government Experimental Farm at Madras, during the past twelve months, this crop has largely been grown, and, generally, with very satisfactory results. We propose, briefly, recording some of the facts ascertained and some of the conclusions formed regarding the culture of this crop for fodder. These conclusions are not founded on a single experiment, but on a large number, occupying, in the aggregate, nearly fifty acres of land. The season was certainly very unpropitious for cultivation of any sort, more especially for cultivation conducted on a soil so extremely sandy and porous as that constituting the Government Farm. The following is an average analysis of the soils upon which these crops were grown:—

	Per cent.
Alumina	2·24
Oxide of iron	1·85
Phosphate of lime	·13
Carbonate of lime	·21
Sulphate of lime	traces.
Carbonate of magnesia	"
Chlorides	"
Water	free
Organic matter	2·11
Sand	93·97
	100·00

We now proceed to record the results obtained from two or three of our experimental plots.

Experiments.

In December 1868 we sowed a plot containing 2,420 square yards, or half an acre of land, with yellow cholum, and have, in the eleven months which have since elapsed, obtained five cuttings, yielding in all 10 tons 5 cwt. 56 lbs., or 23 tons 2 cwt. 14 lbs., per acre per annum.

Another plot of a similar size was sown in April last, and, during the seven months it has been growing, has yielded three cuttings, weighing 4 tons 15 cwt. and 16 lbs. At the present time there is probably about one-third of a crop in the field, making a total of 6 tons 7 cwt. 20 lbs., or a gross produce of 21 tons 16 cwt. and 8 lbs. per acre per annum.

Both of these crops were occasionally watered. The first crop was irrigated weekly during the first three months of the experiment, and about twice a month afterwards. The other about twice a week during the first four or five months, and not oftener than once a month during the remainder of the time. At each time of watering, the water was applied at the rate of about 30,000 gallons per acre. Had a sufficient quantity of water been available, much better results would have been obtained. During the last few months the ground was frequently in such a dry parched condition, the result of the excessively dry season, that for weeks together the bulk of the crop was scarcely increased. The first plot received no manure, except about 4 cwt. of wood-ashes. To the other plot, which had just borne a crop of maize, about 5 tons of farmyard manure was applied.

Another plot of ground, measuring 21·10 acres, was sown during the last week of June. No water was applied to this crop; it entirely depended on the rains and dews for its supply of moisture. Two cuttings have been obtained, weighing 8 tons 12 cwt., and there is still about 20 cwt. in the field, making a total return of 9 tons 10 cwt., during the five months the crop has been growing, or, presuming that the rains and dews will suffice for the wants of the crop for three months longer, an average yearly return of 7 tons 12 cwt. per acre. Manure was applied to this crop at the rate of 8 tons per acre.

These are not exceptional results: the crops now growing on the farm will probably yield larger returns than any we have recorded.

Soils.

Yellow cholum can be grown on all kinds of cultivated land, provided the soil is in a good condition, and is fairly manured and cultivated. If the soil is naturally rich in plant-food, or is made so by artificial means, the larger will be the returns.

Cultivation.

It is advisable to plough the land *well*: the number of times and the depth will depend on its condition, and must be left to the intelligence of the cultivator. Our practice, when the soil contains only a few weeds, is to plough to the depth of 5 or 6 inches, and cross with a broad-share cultivator at right angles to the line of the plough; collect the weeds; broad-cast about 6 or 7 tons of foldyard-manure over the surface; plough in the manure, driving the plough across the lines of the first ploughing; harrow the surface to make it level; and then sow the seeds in lines about twenty-six inches apart, finishing the work by passing the chain-harrows over the surface. If intended for irrigation, we proceed as follows:—plough 5 or 6 inches deep; cross with cultivator to level the furrows; collect weeds; drill the soil in ridges about 28 inches wide, either with a single or a double mould-board plough; spread the manure in the lines between the ridges; split the ridges with the plough, throwing a furrow on the manure on either side the track of the plough, forming the open furrow, down which the water passes, while the crop is being irrigated. The land is thus left in *ridge and furrow* as is the custom in England, for the cultivation of turnips or mangolds. The seed is sown on the top of the ridge over the manure. Whether sown on the level surface or on the ridge, from 26 to 30 pounds of seed per acre will suffice. During the growth of the crop, the ground between the lines of plants should be kept as free from weeds as possible, either by frequent use of the hand-hoe or bullock-hoe. If the land is tolerably free from weeds, two bullock-hoeings and one hand-hoeing will suffice between each cutting.

Water.

Irrigation produces at least three times the weight of fodder obtained under dry cultivation. In the former case, the crop will continue to grow eleven or twelve months, and give six or eight cuttings; while in the latter only seven or eight months, and yield three or four cuttings. Water should be applied once or twice a week, according to the state of the weather and condition of the soil; if water can be obtained at a reasonable cost, we would apply it twice a week for three weeks after sowing and after cutting, and once a week afterwards. Dressings of from twelve to fifteen thousand gallons per acre will be sufficient for each application. However, as we have already stated, much depends upon the poverty of the soil and the humidity of the atmosphere.

Manure.

There is nothing like a good application of foldyard-manure for producing a *good* crop, though, in the absence of this, poudrette, tank-mud, (which has been previously thoroughly exposed to the air), burnt earth, the refuse of brickyards, wood-ashes,

[illegible]

After Cultivation.

	Rs.	a.	p.
2 Hand-hoeings	1	0	0
2 Bullock-hoeings	1	0	0
2 Cuttings	1	0	0
	3	1	0

With a gross yield of 8 tons per acre, the cost of the fodder will be rupees 2 annas 14 and pie 1 per ton.

When irrigated the cost per acre will be as below :—

	Rs.	a.	p.
Ploughing ..	1	0	0
Cultivating ..	0	8	0
Collecting weeds ..	0	12	0
Ridging soil ..	0	8	0
Six tons of manure ..	4	0	0
Spreading manure ..	0	8	0
Splitting ridges ..	0	8	0
Seed ..	1	0	0
Sowing ..	0	8	0
After Culture.			
2 Hand-hoeings ..	0	8	0
12 Bullock hoeings ..	6	0	0
3 Cuttings ..	3	0	0
Raising 80,000 gallons of water a height of 18 feet, and distributing the water, &c. ..	20	0	0
	37	14	0

With a gross return of 24 tons of fodder, the cost per ton will be rupee 1 annas 14 and pies 11.

Summary.

1. Yellow cholum is suited for cultivation on all cultivated soils and in all climates where the temperature does not often fall below 60 degrees.

2. Weight for weight it contains a larger proportion of nutritious matters than turnips.

3. It is best cut for fodder when two-thirds grown.

4. When irrigated, 24 tons per acre per annum can readily be grown.

5. As a dry crop, it will grow for seven or eight months, yielding about four cuttings, weighing 8 tons.

6. When cut in the green state, it is readily eaten by horses, cattle, sheep, and pigs.

7. Under dry cultivation one ton of the green fodder can be grown for rupees 2 annas 14 and pie 1.

8. When irrigated, one ton for the green fodder can be grown for rupees 1 annas 14 and pies 11.

REPORT ON THE CULTIVATION OF CAROLINA PADDY AT THE GOVERNMENT EXPERIMENTAL FARM.

The seed was obtained from the Tanjore district; it was a good [illegible] thoroughly dry 1,604 grains weighed one ounce, and a Madras measure weighed thirty-two ounces. It contained [illegible] of husked grains.

The soil upon which the experiment was conducted is similar to the majority of our soils, poor in the extreme; however, the sub-soil is rather stiffer than is usually the case on this farm. The land lies eighteen feet above water-level.

Mr. Ferguson, the Government Astronomer, has very kindly furnished me with the following meteorological [illegible] at the Madras Observatory. The first table shows the daily mean temperature, the second the daily rainfall during the six months over which the experiments extended :—

Daily Temperature.

	September.	October.	November.	December.	January.	February.
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Daily Rainfall.

	September.	October.	November.	December.	January.	February.
1	..	[illegible]	[illegible]	..	..	..
2	[illegible]	[illegible]	[illegible]	..	..	..
3	[illegible]	[illegible]	[illegible]	..	..	..
4	[illegible]	..	..	..	..	..
5	..	..	..	..	..	..
6	[illegible]	..	[illegible]	..	..	..
7	..	..	[illegible]	..	..	..
8	..	..	[illegible]	..	..	..
9	..	..	[illegible]	..	..	..
10	..	..	..	..	..	..
11	..	..	..	..	..	..
12	..	[illegible]	..	[illegible]	..	..
13	[illegible]	[illegible]	..	[illegible]	..	..
14	[illegible]	..	[illegible]	[illegible]	..	..
15	[illegible]	[illegible]	[illegible]	[illegible]	..	..
16	[illegible]	..	[illegible]	[illegible]	..	..
17	[illegible]	..	[illegible]	[illegible]	[illegible]	[illegible]
18	..	..	[illegible]	..	..	..
19	[illegible]	..	[illegible]	..	..	..
20	..	[illegible]	[illegible]	..	..	..
21	[illegible]	..	[illegible]	..	..	..
22	..	..	..	..	..	..
23	..	..	..	..	..	..
24	..	..	[illegible]	[illegible]	..	..
25	[illegible]	..	[illegible]	[illegible]	..	..
26	[illegible]	..	[illegible]	[illegible]	..	..
27	[illegible]	[illegible]	[illegible]	..	..	..
28	[illegible]	[illegible]	[illegible]	..	..	..
29	..	[illegible]	..	..	..	..
30	[illegible]	[illegible]	..	..	..	..
31	..	[illegible]	..	..	..	..
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The plots were sown at different times, the first on the 22nd of August, and the last on the 6th of November; as the seed was good and free from any sign of disease, it was not dressed with any chemical solution. The seed-beds were prepared in the usual manner, excepting that they were deeper dug and more highly manured. The seedlings in plots 2 and 6 were about twenty days old, and in plots 3 and 4 sixteen days old when planted out. Plots 1 and 5 were sown broad-cast, the grain being previously sprouted.

All the plots were puddled and worked according to the usual native system. The manure was put into the puddle and worked thoroughly amongst it with the plough. The seedlings were not planted out until the first effects of the rapid putrefaction of the manure had passed off. The importance of delaying planting operations until this stage, in the putrefactive process has been reached, is well understood by native cultivators; they always delay planting until the rapid fermentation of the manure has ceased, and the discharge of bad smelling gases has ended. If the plants are put into the ground while these gases are being given off, they are either killed at once, or are permanently injured.

We experienced no difficulty in raising the plants from the seed-bed. The soil having been well manured, the roots were short.

Before planting commenced the soil was again thoroughly puddled. The plants were put down in bunches of two or three placed about eight or nine inches apart, they were merely pressed into the puddle; with the hands of the planters very little pressure was required, as the puddle was so yielding; eight coolies can easily plant one acre in a day.

In every case the plants looked very sickly and yellow until five or six weeks after planting. However, when a week or two older, they usually made a fresh start, and continued afterwards to grow with great rapidity.

The seed broad-casted on plots 1 and 5 was sown upon the puddled surface. Plot 1 was *very* heavily seeded. Both crops grew regularly, but No. 1 was much too thickly covered with plants.

The following table shows the areas of the plots, the quantities of seeds sown, and description and quantity of manure used :—

	No. of Plot.	Area in sq. yds.	Date of Planting.	Manure.	Seed. Weight.	Seed. Measure.	Manure.	Per Acre. Seed. Weight.	Per Acre. Seed. Measure.
Transplanted.	2	536	September 15th	Wild Indigo, 578 lbs. Farm-yard manure, 672 lbs.	4 lbs.	2	Wild Indigo, 2,057 lbs. Fold-yard manure, 14,377 lbs.	11 lbs.	11
	3	225	October 8th		1	4		24	24
	4	266	October 8th	Sheep-shed manure, 992 lbs.	4	2	Sheep-shed manure, 2,980 lbs.	23	11
	6	267	October 15th	No manure.	4	2	No manure.	26	10
Broad-cast.	1	501	September 22nd	Madder Leaves, 576 lbs. Bone Dust, 112 lbs.	10 lbs.	5 Measure	Madder Leaves, 1,866 lbs. Bone Dust, 1,024 lbs.	55 lbs.	241 Measure
	5	536	October 4th		4	2		26	10

The results obtained were very irregular, chiefly owing to the different conditions of the soil. Though chemically the same, there was a considerable difference in its physical condition. The field *had just been levelled*, the hilly parts had been reduced to fill up the hollows, thus in places exposing the raw subsoil. The experiments require to be repeated. However, they *most conclusively prove that Carolina paddy is a most productive grain, and that it grows as readily under ordinary culture, as indigenous varieties of paddy.* The following are the general results :—

Transplanted.

Number of Plot.	Date when reaped.	Yield. Grain. Weight.	Yield. Grain. Measure.	Yield. Straw.	Yield per Acre. Grain. Weight.	Yield per Acre. Grain. Measure.	Yield per Acre. Straw.
		lbs.	Measure.	lbs.	lbs.	Measure.	lbs.
2	December 17th	115	2·8	644	2,498	1,152	3,496
3	February 8th	160	4·1	370	3,441	1,695	7,183
4	January 21st	261	12·0	588	1,420	656	3,217
6	February 10th	240	12·8	532	1,467	947	2,698

Broad-Cast.

Number of Plot.	Date when reaped.	Yield. Grain. Weight.	Yield. Grain. Measure.	Yield. Straw.	Yield per Acre. Grain. Weight.	Yield per Acre. Grain. Measure.	Yield per Acre. Straw.
		lbs.	Measure.	lbs.	lbs.	Measure.	lbs.
1	January 10th	359	169	1,602	1,788	829	3,203
5	February 4th	196	88	386	1,708	794	3,365

The average return per acre of these six experimental plots is 927 measures, or about 46 bushels of grain and 4,245 pounds of straw.

These experiments have very clearly demonstrated that a supply of good manure is as necessary for the successful cultivation of paddy as of *any* other farm-crop. Thus, a dressing of about six tons of farm-yard manure produced 1,206 measures or about 75 bushels of grain per acre, and a dressing of 2,057 lbs. of wild Indigo produced 1,122 measures or about 56 bushels per acre; while the unmanured plot only produced 647 measures or about 32 bushels per acre.

During greater part of the experiment, the ground was kept only in a damp state; water was very seldom lying on its surface, and never more than an inch or two in depth. Plot 2 may be taken as an illustration; during the growth of this crop, the ground was watered about twenty-two times; each time with a quantity equal to a rain-fall of 1½ inches, and the rain-fall during the ninety-three days from planting to reaping amounted to 14·81 inches, making a total of 47·81 inches. Fully one-third of the rain-fall was lost, by falling when not required. Thus 5,600 cubic yards of water was required for maturing the crop from time of planting. When the seed is sown broad-cast probably another 1,000 cubic yards will be required.

A plot, measuring 523 square yards, was well ploughed and manured with about one cwt. of a mixture composed of equal parts of guano and bones; 1½ measures of paddy was sown in lines across the ground. No water was applied to the crop; *it was cultivated like a dry crop.* The plants grew about 15 inches high, and then withered away. The yield was only 2 measures of grain and 142 lbs. of straw. Though the rain was frequent during the experiment, amounting in all to a total fall of 21·98 inches, yet the plants never throve after reaching four inches in height.

MANURE IN COTTON GROWING.

(*Official Papers.*)

THE following letter from Mr H. Rivett-Carnac, Esq., Cotton Commissioner; to the Secretary to the Government of India, in the Department of Agriculture, Revenue, and Commerce, dated Allahabad, 18th July 1871, appears in the *Gazette of India* :—

With reference to the letter of the Secretary to the Government of India, in the Home Department, No. 1641, dated 24th of March, and previous correspondence, I have now the honour to report on the experiments made with Compton's patent manure at the farms in the Central Provinces and the Berars.

This report would have been submitted at a much earlier date had it not been that I was anxious, if possible, to submit detailed information regarding the produce of the land to which the manure was applied, as compared with the crop on the adjoining unmanured fields, together with a tabulated statement showing the financial results. After much inquiry, however, I have ascertained that, for the reasons to be noticed in a later paragraph, it will not be possible to supply this information in a satisfactory manner, or to submit the report in the form which I had first planned.

The orders of the Government of India to procure a supply of this manure, and to try its effect on the cotton farms, were unfortunately not received until the month of August. No time was lost in obtaining a supply from Bombay, but by the time the casks reached the farms, the plants were well above ground, and the manure, instead of being ploughed into the ground before the sowing of the seed, had to be applied as a top-dressing, by which its effect was much diminished. The results were indeed so unfortunate that, as the trial could not be considered a fair one, no special report was made by the assistants on the subject, and the matter was allowed to stand over until further and less unsatisfactory experiments could be undertaken. The following details have now been received in answer to the call made by the Home Department.

Mr. Dunlop, the Assistant to the Cotton Commissioner, West Berar, thus reports :—

"The manure arrived late in the season, and was applied as a 'top-dressing' to the plants. Owing to this probably no marked effect was noticeable in that season's crop; and as you are aware the present farm is now situated in a different locality.

"Although, however, the farm could not benefit by the manure, I arranged with one of my former pupils that he should cultivate the manured land with cotton, and in this way I have been able to give it a fair trial.

"The area of manured land was two acres. It was re-sown with bunnee' seed in the beginning of last rains. The plants came up well, and were large, strong, and fresh-looking, while the ordinary cotton plants were leafless and withered. The crop has been wholly picked, the turn-out being at the rate of 78 lbs. of clean cotton per acre. The seed was sown thinly, which explains the small out-turn. The field might have contained 40 per cent. more plants, and this year's experience has shown us that there is no advantage in thin sowing.

"A small quantity of the manure was also given to some land in

which the owner has this season cultivated maize. The crop was the finest of the kind I have yet seen in Berar; many of the stalks bearing two large ears. I should mention, however, that this field had also been deeply ploughed the previous year.

With these results, I conclude that the manure is quite a success, in so far as it improved the yield and strengthened the plants; but I doubt if it could be laid down sufficiently cheaply to give a satisfactory financial result to the cultivator."

The following report from Mr. Nago Rao Jeya Krishna, the Assistant to the Cotton Commissioner at Comptoo, confirms very much the views expressed by Mr. Dunlop as to the late arrival of the manure affecting the experiment :—

"I have the honour to report that about 550 lbs. of Compton's patent chemical manure were supplied to me by Messrs. Stearns, Hobart and Company; but, unfortunately, the manure reached the Comptoo model farm towards the end of August, when the cotton plants were in flower, and the manure was, therefore, applied only as a 'top-dressing.' Moreover, there was no water at the farm to irrigate the manured parts, and consequently the result was not as favourable as it was expected. The manured plants looked a little stronger and better than the unmanured."

The experiments above referred to were undertaken during the season of 1869-70. Instructions were issued to supply the farm in the Wurdah valley with 5 cwts. of this guano for experiment. The supply arrived so late that, in accordance with my instructions, the guano was reserved until last season, when it was applied at the Mudnee farm, under the direction of Mr. Noble.

Here, too, the experiment was most unfortunate. The river bore, across which a dam had been thrown in accordance with a scheme for irrigating the model farm, overflowed and inundated the adjoining lands, including that which had been prepared with this manure. The results are described in the following extract from Mr. Noble's report :—

"The effects of the manure at first were very apparent, causing the young seedlings to grow up sturdier and quicker than the others. But after the growing plants had been up for a short while, nearly the whole of the farm was inundated twice, the second flood occurring about eight days after the first. All the manured portion was completely flooded, and no doubt the greater portion of the manure must have been carried away with the flood, or perhaps distributed over all the land which was flooded. In consequence, I do not think it would be fair to take the manured portion as a fair sample of manured cotton. The plants in this piece (manured with the cotton manure) are not superior to some other parts of the farm. One portion of this piece was completely re-sown ('bukhur' having first been passed over), and this part is superior to the other which was not re-sown.

"From what I have written above, and in my weekly reports at the time the floods occurred, I think you will agree with me that I am not well able to speak positively about what effects have resulted from the use of the manure. If the manured portion had turned out superior to the rest of the farm, then, of course, allowing a difference for different kinds of soil, it would have been apparent that this superiority was due to the use of the manure, but such is not the case. Some parts of it are, perhaps, equal to the other parts of the farm, but there are also some parts of it decidedly inferior."

It must then be admitted that the manure has not yet had a fair trial. In fact, the experiments were undertaken under such manifest disadvantages that, as already noticed, no special record was kept on the subject. I was therefore anxious to try its effects again this season; but on application to the agents in Bombay, I learnt that none of the manure is available in Bombay. Should His Excellency the Governor-General in Council desire it, arrangements can be made to ensure a supply being obtained early next year, so as to admit of the fertilizer being well ploughed into the soil before the seed is sown, and the effect thus being thoroughly tested next season.

Judging from the accompanying analysis of the manure, and of the black cotton soil of the Deccan, there can, I think, be little doubt that the manure, if properly applied, would benefit the cotton fields of the Berars, although exactly to what extent it is not possible to predict, by giving back to the soil many of those fertilizing ingredients which the cotton plant absorbs. The following is the analysis of the manure as given by Messrs Compton and Company :—

Ammoniacal organic matter	29·5
Alkaline salts	9·5
Phosphate of lime and magnesia	17·5
Sulphate of lime	7·0
Carbonate of lime and magnesia	12·5
Vegetable organic matter	8·0
Silicates, clayey and sand	5·0
Water (hygroscopic)	10·0
	100·0

Austed's analysis of the "regur" or black cotton soil of the Deccan is as follows :—

Silica	33·20
Alumina	20·20
Carbonate of lime	16·00
Carbonate of magnesia	10·20
Oxide of iron	4·00
Water and organic matter	6·20
	100·00

The chief question involved in the proposed use of this and other imported fertilizers rests, however, on the point whether they can or cannot be used by the cultivators of the Berars at a profit, *i. e.*, whether, after deducting the expenses connected with the purchase and application of the manure, the extra yield of cotton resulting from the use of the fertilizer will leave a balance of profit in the hands of the ryot, sufficient to encourage him to adopt this improved system of farming.

Another question also is involved, which will be noticed at the close of this report, and that is, whether manure to any great extent can safely be used without a supply of water ready at hand to be applied in the event of the rain-fall failing.

Although, for the reasons already stated, it is not in my power to give reliable figures showing the actual yield of cotton on the lands at the farms which enjoyed the advantage of the manure, compared with the yield on those lands to which no manure was applied, still I am able to give the cost of the manure as laid down on our farms, and from this it may be judged whether there is a fair probability of this and other imported chemical manures being generally adopted in the Berars.

The cost of this manure delivered at Bombay or Calcutta is £8 per ton. The railway carriage on goods of the first or lowest class is 0·5 pie per ton per mile for distance over 400 miles, with a terminal charge of Rs. 2-1-9, and in this class fertilizers would apparently be included. Now Comptoo, which is about the centre of the Central Provinces and Berar cotton field, is 438 miles from Bombay, whilst Nagpore, which is quite at the northern extremity, is 530 miles distant from that port; Mulkapore, the nearest point, being 327 miles distant from Bombay. It will not then be unfair to calculate that if this manure were generally adopted in the cotton-growing country, then that in addition to the cost of £8 per each ton at the sea port, an additional charge of about pies 9·5 by 400 pies (the rate per ton per mile multiplied by the number of miles which the manure would have to be carried) or Rs. 15-12-8 *plus* a terminal charge of Rs. 2-1-9, making a total charge of Rs. 21-14-5 for railway freight, would have to be incurred for each ton laid down in Central India, bringing the total cost of a ton of manure up to Rs. 101-14-5.

Now, supposing that this manure was applied to the soil at the rate of 2 cwts. per acre (in America much greater quantities are used), the cost of the manure per acre delivered at the cotton field in Central India would be Rs. 10-14-5. To this again has to be added the cost of spreading the manure and working it into the soil, &c. This, from a careful estimate that has been framed and checked by the actual charges incurred in applying manure of a somewhat similar description last season, amounts to Rs. 2-2 per acre, calculated as follows :—

	Rs.	a.	p.
Spreading 2 cwts. of manure over one acre of ground, four men at four annas per diem	1	0	0
Ploughing the manure into the ground with "bukhur" (one bukhur per one day)	1	0	0
Carting 2 cwts. of manure to the field, say on an average	0	2	0

The estimate is framed for land near the railway line. The cartage to places at a distance would of course be more expensive.

The total cost to the cultivators of the 2 cwts. of manure up to the time of its being ploughed into the soil would then be as follows :—

Cost of 2 cwts. of manure sufficient to sow one acre of cotton land.

Cost in Bombay	8	0	0
Railway charges	2	2	0·5
Cost of ploughing into the land	2	2	0
Total	12	5	0·5

To ensure the cost of manure being repaid to the cultivator, it would be necessary then that the acre to which the manure was applied, should bear a certain number of pounds clean cotton in excess of that produced by the neighbouring land, which did not enjoy the advantage of the manure, and on which thus the expenditure of Rs. 12-5-0·5 shown above, would not have been incurred.

Given the price of cotton per pound in the cotton districts, it becomes then a not very intricate rule-of-three sum to determine how many additional pounds of cotton it would be incumbent on the one acre of land to grow in excess of that grown by its neighbour, the less favoured acre, to enable the cultivator to cover the expenses of the experiments. Now the price of cotton has varied very considerably during even the last few years. I put the prices that were touched during the American war out of the question, as we are not likely to see them again at present.

Now the price of cotton per pound in Liverpool, by which the price of the staple at the markets of Bombay and up-country is generally governed,* stood during the past cotton-selling season, *i. e.*, from December to the end of May, as follows :—

*I say generally, because sometimes from the action of speculators or one cause and another, the price of cotton in Bombay and the up-country markets is actually higher than in Liverpool

PRICE PER POUND.

H. denotes the highest quotation, L. the Lowest.

Months.	Fair Dhollera		Fair Oomraotee		Fair Hinganghat.	
	H.	L.	H.	L.	H.	L.
	d.	d.	d.	d.	d.	d.
December	6 7/16	6¼	6¼	6¼	7¼	7¼
January	6¼	5¾	6¼	6¼	7¼	7¼
February	6¼	6¼	6¼	6¼	6¾	6¾
March	6¼	5¾	6¼	6	6¼	6¼
April	6¼	5¾	6¼	5¾	6¼	6¼
May	6 1/16	6¼	6¼	5¾	6¼	6

Since then the market has improved, and Fair Dhollera was quoted at Liverpool on the 15th instant, at 7-7-16*d.* per pound.

The cotton of our Provinces is, as will be seen from the above statement, worth rather more than the Fair Dhollera, the standard quotation; for instance, when Fair Dhollera stood at 6-1-16d, Fair Oomraotee was selling at 6¼*d.*, Fair Hinganghat at rather a higher figure again, at 6¾*d.*

The price of cotton in the Berars from December to the end of May, when the selling season closed, has varied in a manner corresponding, cotton being sold at Oomraotee (the sales at which market I propose to take as the standard for my calculation) from Rs. 52 per bojah of lbs. 260 to Rs. 48 per bojah of the same weight. This year prices have admittedly been very low. During the present month, however, consequent on the Liverpool quotations, the price rose to Rs. 63 per bojah.

I propose then taking Rs. 60 per bojah as a fair average, and at this price the Berar cultivator gets, if we value the rupee at 2*s.*, a trifle more than 5¼*d.* or 3 annas 8 pie per pound for his cotton, the exact figure being 5·542*d.* (with exchange at 1*s.* 10¾*d.* it is 5·25*d.*).

I have adopted present exchange 1s. 10¾d. 1 Rupee.

The Liverpool price corresponding with cotton selling at Oomraotee at Rs. 60 a bojah or 5·25*d.* would be, roughly speaking, about 7·365*d* per pound,* which, considering the present condition of the trade, may I think, be accepted as a fair price on which to base the following calculation.

The ryot then sells his cotton at 3 annas 8 pie a pound. The manure costs Rs. 12-5-0·5 per acre. To ascertain then the number of additional pounds of cotton that the manured acre must yield to repay the cost of experiment, the following sum has to be worked out:—

Rs.	a.	p.	Rs.	a.	p.	lb.	lbs.
0	3	8	12	5	0·5	1	51

which gives, as will be seen above, 51 lbs. of cotton as the result.

It will be seen then that for the manure to repay the expenditure, it would be necessary that the acre so manured, should yield 51 lbs. more cotton than an acre of unmanured land of similar quality. There would also be a corresponding quantity of seed in excess; but, as the additional seed would have to be put against the additional expense of cleaning the increased quantity of cotton, it may be excluded from the calculation.

Now, as the Berar cotton lands in a good season bear from 80 to 100 lbs. of cleaned cotton to the acre, it would not be an extraordinary success for a fertiliser to achieve to increase the produce by, say, 50 per cent., and it will be seen from the above calculation that such an increase would about pay the cost of the experiment. This would of course be a very satisfactory result for the trade, as the supply of the raw material would be increased, but hardly gratifying to the cultivator, who, in reward for some extra trouble, risk, and anxiety, would only just be able to pay expenses incurred. If the crop were doubled by the manure, the ryot would then make a profit of about Rs. 12 per acre. But I doubt if this effect could be expected from the fertilizers as a continuance. It is, however, to be remembered that in the Berars the experiment is weighted by a railway freight of Rs. 2-3-0·5, or 18 per cent. having to be paid on the manure; and if this charge be deducted, as would be done in the case of an experiment undertaken near the sea coast, then, with cotton selling on the spot at Rs. 60 per bojah of 260 lbs., an extra yield of not more than 44 lbs. would be required to cover the expense of the experiment, and thus an increased yield of 50 lbs. would give the cultivator a profit of Rs. 1-6 per acre.

I fear, however, these figures, though not perhaps discouraging, are not very hopeful for the imported manure. No one feels more strongly than I do, the importance of trying to increase the yield per acre of our cotton tracts. But I believe that we must look to a cheaper fertiliser than that which can be imported from abroad, and with this object, experiments are being made with poudrette, prepared on the dry earth system, and with several other descriptions of manures.

Native cultivators are, it is well known, fully alive to the benefit resulting from the use of manure. In the Berars the patches on which irrigated crops are raised, receive as much of the cattle manure as can be spared after the quantity set aside for fuel has been supplied. But where irrigation is not available, but little manure is used. This arises from two causes,—the one, that but little manure is available; the second, that the application of manure in any considerable quantity to land which cannot be artificially watered, in the opinion of the natives, who are not bad judges in such a matter, is attended with some risk.

The subject is explained in the following paragraphs of my report for 1868-69, paragraphs 90, 91 and 92, page 73, which for facility of reference, are quoted below:—

Para. 90. The success of the experiments with manures in America and the possibility of providing a cheap manure being borne in mind, the great stumbling-block already hinted at, which lies across the path of the general adoption of a system of manuring the cotton lands, has now to be noticed; and if the importance of increasing the cotton supply has been satisfactorily explained, then the necessity of removing the obstacle will, I hope, be apparent.

91. It has been noticed in a former paragraph that a native, when advised to use manure, will answer that it is a very risky measure, that its success will depend on the season; that manure and water must go together; that in a wet season a manured field will give a splendid return; that if the rain fails, the cotton, which without manure would have successfully weathered the drought, will be an utter failure; the manure exciting the plant, burning it up, or driving it to wood; that he is a poor man dependent altogether on his field; that even if he had the manure, he cares not to run the risk; and that as with exotic seed he prefers a certainty, with moderate returns, to an uncertainty. And, perhaps, he cannot be blamed. Nor would it be wise, having regard to the extreme caprice exhibited by the last few rainy seasons in this part of India, to advocate any general application in considerable quantities of manure. Had this been done last season, the result would, I believe, have been very different from what I have now had the pleasure of recording, and the crop would hardly have successfully weathered a season so extremely trying to all classes of cultivation. For without a sufficient supply of water, as the cultivators say, manure, there is good cause to believe, destroys the crops. But give the plant plenty of manure and plenty of water, and the result is widely different, the crop will be a magnificent one. Therefore, then, if we wish to increase our cotton supply, we must, I believe, call irrigation also to our aid. It will not do to manure the fields and risk a failure of the crops from a scanty rain fall. We must insure the out turn, and have water at hand ready to be turned on if necessary, the works being undertaken by Government, and the cultivator paying an annual premium on the insurance in the form of a water-rate.

92. I am not unprepared for many arguments against the necessity of irrigation. "Indian cotton does not require irrigation," it has often been said, and to this I quite agree, that is to say, to get the cotton of the quality, and in the quantity we now do, irrigation is not certainly required. The last season is the best proof of that. But then the question is, are we to be content with the present results? Are we to be content with getting 50 or 280 of somewhat inferior cotton to the acre? If the answer is that we are morally bound to do our very best to increase the supply, then I altogether doubt any results being achieved without the assistance of the fertilizer; and the fertilizer entails irrigation; and I believe it will be found in the long run that irrigation we must have.

Up to the present moment, however, the schemes for irrigating the cotton lands in the Central Provinces and the Berars, have not, so far as I am informed, progressed beyond the preliminary stages, and until more progress is made in this respect, we cannot I fear, do much for increasing the yield of cotton in Central India by the use of fertilizers.

The reports I am now receiving from Berar show that this season the rain has held off, and that the crop is suffering. If the rain returns soon, I hope that our sturdy little cotton plants will yet pull through. But had the cotton-growing tracts been heavily manured, there would, I think, have been little hope of the plants, stimulated by the manures, making a stand against the ill-effects of the scarcity of rain.

It may be noted here that several experiments have been made during the past season with other descriptions of manure. I have purposely omitted any detail of the results in this report, which refers to the manure received from Australia.

Calculation—cost of Oomraotee cotton laid down in Liverpool.

The cost in Oomraotee, and charges from thence to Liverpool, are given *approximately*.

They will vary according to many circumstances that need not here be detailed.

* It may be satisfactory to show how this figure is arrived at. Three bojahs of 260 lbs. each, equal to a Bombay candy of 784 lbs. (or two bales of 3½ cwt. each); the dry Berar cotton gaining something small in weight in the damp climate of Bombay, and the difference of 4 lbs. being thus accounted for.

The price of one candy of 3 bojahs (784 lbs.) at Rs. 60 equals to Rs. 180, but to this has to be added the expenses incident on sending this cotton to Bombay, agency, pressing charges, freight, &c. These charges are taken at about Rs. 34 a candy, and the price of a candy of Berar cotton laid down in Bombay is thus brought up to Rs. 214 per candy of 784 lbs. Now the equivalent Liverpool quotation for Oomraotee cotton, costing in the Oomraotee market Rs. 60 per bojah (or 5·25 to the cultivator, and selling in the Bombay market at Rs. 214 per candy, would be taking exchange at 1s. 10¾d. per rupee, and freight (Suez Canal) at £3 per ton, and allowing the usual charges for commission, insurance, &c., 7·366d per pound. The calculation will vary slightly according to exchange, freight, &c., but the above will be found nearly correct.

In fact, when the Manchester spinner can afford to give 7·366d for "Fair Oomraotee," the cultivator in Berar gets about 5¼d., of this sum the balance of upwards of 2d being absorbed in the charges incurred in agency, freight, &c., between the Oomraotee, cotton market and the factory in Manchester. I have thought it desirable to work out the figures, and give the details in an Appendix.

Price at Oomraotee.

The cultivator sells his cotton in the Oomraotee market to the European agent for Rs. 3[illegible] a bojah of 280 lbs., i. e., the ryot pockets [illegible] annas 6 pies per pound, which, at 1s. 10½d. exchange, is equal to 4·[illegible] per pound.

The price realised by cultivators per pound there, is 5·2½d.

Charges between Oomraotee and Bombay.

The calculations are now made on the Bombay candy of 784 lbs., which equals three bojahs of 260 lbs., *plus* 4 lbs. minus difference gained in weight by Oomraotee cotton in the damp climate of Bombay—

	Rs.	a.	p.	Pence per pound.
Price of a candy or 784 lbs. of cotton at Oomraotee	180	0	0	or 5·25
Charges between Oomraotee and Bombay.				
Pressing in bales ready for shipment per candy (3 bales) ..	7	0	0	
Railway freight from Oomraotee to Bombay, including terminals on 784 lbs. (*plus* 60 lbs. tare) *i. e.*, on 824 lbs. at Rs. 1-11-6 per maund of cotton of 82 lbs..	17	0	0	
Petties, discount on Bombay bill, *&c.*	2	0	0	
	206	0	0	
Commission at 4 per cent.	8	0	0	
Total cost of a candy laid down in Bombay	214	0	0	or 6·209d.

Thus, charges between Oomraotee and Bombay Rs. 34 or ·95d.

Charges between Bombay and Liverpool.

	Rs.	a.	p.		Pence per lb.
Price of a candy of 784 lbs. delivered in Bombay, as shown separately	214	0	0	...	6·209
Brokerage at ½ per cent	0	8	7	Charges between Bombay and Liverpool.	
Shipping charges and petties	2	0	0		
Freight at £3 per ton	15	0	0		
English charges and fire insurance, 2 per cent ..	2	0	0		
Rs...	233	8	7		·807
Insurance at ¾ per cent	5	13	3		
Rs....	239	5	10		
Discount (one month and-a-half at 1 per cent. ..	2	6	0		
Price at Liverpool without profit	241	12	7	..	7·016
Profit at 5 per cent	12	1	5	.	·35
Total price in Liverpool ... Rs.	253	14	0	for 784 lbs.	or 7·366

(5)—Thus the ryot gets	5 2½d per lb.	
(6)—Charges from Oomraotee to Bombay (including Agent's commission)	·95d. ..	Exchange at 1s 10½d. to the Rupee.
(7)—Charges between Bombay and Liverpool ..	·807d. ..	
(8)—Add profit at 5 per cent	·35d. ..	
	7 366d. ..	

RESOLUTION BY THE GOVERNMENT OF INDIA IN THE DEPARTMENT OF AGRICULTURE, REVENUE AND COMMERCE, DATED SIMLA, THE 16TH AUGUST 1871.

OBSERVATIONS.—From the various reports of the experiments that have been made, it appears that so far as this manure has yet been tried in India, it has not proved a success. It is not however impossible that its apparent failure may be due to some error in the methods of applying it, and a communication will be addressed to Messrs. Compton and Company on the subject.

ORDER.—Ordered that a copy of this resolution of Mr. Carnac's report in full, and of the precis of correspondence, be forwarded to Messrs. C. H. Compton and Company, and that they be invited to furnish Government with two tons of their chemical manure for further experiment, on the same terms as before, together with any remarks they may have to offer as to the probable causes of the unfavourable results of past experiments, and full and detailed instructions as to the best methods of employing the supply now asked for; also to state what would be the lowest price per 100 tons for which they could deliver the manure, free of all other charges, at Calcutta, Madras, and Bombay, in the event of considerable quantities being at any time required; as even if future experiments should prove more successful than those hitherto undertaken, the possibility of largely utilizing this manure must depend chiefly on the price at which it can be delivered in India.

Ordered also that a copy of this resolution, Mr. Carnac's report, and the precis of correspondence, be forwarded to the Secretary to the Agri-Horticultural Society, Punjaub, for information, and to the Governments of Bengal and the North-Western Provinces, and the Chief Commissioner of Oudh, for information and communication to the Societies, Superintendents of public gardens, and private parties who have tried and reported on this manure.

Ordered also that a copy of this resolution, and of the precis of correspondence, be forwarded to the Cotton Commissioner of the Central Provinces and Berar.

Ordered further that this resolution, Mr. Rivett-Carnac's report, and the precis of correspondence, be published in the supplement to the *Gazette of India*.

* Rs. 65 per bojah is above the average price of the past season, which was, comparatively speaking, a bad one for the ryot, the price having ranged from Rs. 40 to Rs. 55 per bojah since the rise in the price of cotton at Liverpool; since June the price at Oomraotee is more than Rs. 60.

† Trade discount at ¾ per cent. is generally given. I have not taken this into account.

The Planters' Gazette.

BOMBAY, 21st SEPTEMBER 1871.

THE ESTATES.

To the Editor of the Ceylon Observer.

DEAR SIR,—In a letter I addressed to you last week, I pointed out that the stock of coffee in Europe was heavy on 1st June, being 100,000 tons. In alluding to my communication in your Overland Summary, you state, "the turn in the tide has undoubtedly come, and this is evidenced by the latest detailed intelligence to hand up to 7th ultimo (July), by which it is shewn that stocks had already fallen off."

I am sorry to dispel the pleasing effect of the above, but Reuter telegraphed on 1st August that the stocks in Europe amounted to 116,000 tons. Probably this telegram did not reach you.

The Dutch pamphlet of 1868 is an old story to those who have dealings in Mincing Lane; it served the purpose a few years ago to give the market a lift for a time.—I am, yours truly,

COFFEE.

Colombo, 9th August 1871.

[The arguments made use of in the "Dutch pamphlet of 1868," we beg to say are as fresh and applicable now as they were three years ago. On the very face of his pages, the retired Dutch coffee merchant's purpose was widely different from that of giving the market a lift for a time; for it was those sudden speculative rises and falls which he most strongly deprecated. All he wished to shew was the soundness of the coffee trade: its progressive increase in the past and fair prospect for the future. With the chances of a rise in the price of produce during this or that particular month or season, he did not trouble himself. So far as we can see, however, and notwithstanding the increase of stocks on 1st August, the prospect of a rise in the rates for coffee during the remainder of this year, seems very fair. Our correspondent should have added to his information the important fact that on the 2nd August of last year, the stock of coffee in Europe equalled 118,000 tons.—ED. *C. O.*]

COFFEE.

MYSORE ESTATES.

(The Bombay Gazette.)

MR. R. H. ELLIOT, one of the few successful coffee-planters of Mysore, has lately put his "experiences" on record in a book* which is remarkable for its honest out-spokenness and—a quality rarely found in Indian literature—its freedom from a spirit of partizanship. We shall take another opportunity of noticing Mr Elliot's political views; our object to day is to call attention to those chapters of his book which throw light on the real causes of the frequent failure of European enterprise in India. So much English capital has within the last ten years been fruitlessly sunk in tea and coffee plantations, that one can hardly wonder at the discouragement now prevailing among a class of men whose labours ought to be not *only* profitable to themselves, but most valuable to India. The want of public spirit among non-official Englishmen in this country, which has been painfully conspicuous during the long and wearisome discussions on taxation, is much more natural and excusable in the planters and merchants of the time than in men receiving a fixed income. In Bombay, at all events, any man with a salary is much better off now than he was seven or eight years ago; and salaried Englishmen in India are usually so well paid that a prudent man can save in a few years more money than he could have hoped to amass in a life-time of patient industry at home. There is, therefore, something monstrous in the suggestion that such men should be set free from those obligations which are binding upon

* The Experiences of a Planter in the Jungles of Mysore. By Robert H. Elliot, London: Chapman and Hall, 1871.

the citizens of every State, and that while they live in India, their incomes should remain sacred from the touch of the tax-gatherer. Nor, indeed, can the adventurers who come out to make their fortunes in trade or agriculture, or in the practice of some profession, reasonably claim exemption in India from what is the common lot of humanity — the payment of taxes—merely because they have discovered that their expectations of making large gains every year were too sanguine. They must take the good years wit h the bad, and remember that after all profits are much larg er and taxes much lighter in India than in England. But of course there must be a good deal of grumbling if the State demands more money from these tax-payers at the very time when they are dispirited by heavy losses and ready almost to believe that the greatest mistake an Englishman can commit is to invest capital in any Indian undertaking.

It is easy enough to account for the depression in the cotton trade, and perhaps coffee-planting also has suffered more severely from the ravages of the spirit of speculation than of those more familiar enemies of the planter—"the borer, bug, rot, and rat.' The men who bought land early, when it could be had for a very low price, and who, knowing something of agriculture, settled down to work on their own estates, had a fair chance of doing well. But a large number of properties were purchased by speculators in Bombay and other great towns who had neither time nor capacity to manage their own estates, and whose ignorance of the value of different kinds of soil and of the conditions essential to the growth of good crops often made them the victims of sellers who wished to get rid of their own bad bargains. Mr. Elliot was one of the pioneers of coffee-planting in Mysore. "There was only," he says, "one plantation "proprietor on our (the Munzerabad) side of the province when I "entered it in 1855; and, at the original seat of coffee "in the Nuggur division to the north, there were only three "European planters. Those were glorious days in Munzerabad "when we enjoyed our hunting-grounds and our labour market "in peace, and when twelve long miles separated each planter "from his neighbour." In this sentence we have a suggestion of one of the difficulties which embarrass English planters in this country—one which has ruined whole districts in the tea country—the difficulty of getting a full, steady, and cheap supply of labour. It is satisfactory to find that Mr. Elliot is far from ascribing to the Government the unworthy policy of thwarting the planters' efforts to engage native labourers. He is no admirer of English rule in India—indeed, the heading to one of his chapters is "The harmonious rottenness of our Indian administration"—but so far as the planters are concerned he does full justice to the anxiety of all Government officials to deal with them liberally and in a spirit of earnest co-operation. The point is of so much importance that we make no apology for quoting at some length Mr. Elliot's own words :—

"And here it may not be out of place to say a few words as to the treatment the planters in Mysore have received at the hands of Government from the days of Sir Mark Cubbon to the present time. Whatever may be the case with planters in other parts of India, and however much they may have to say, I feel sure that in Mysore at least the planters have always been treated with an unvarying courtesy and consideration which merit all the acknowledgment that could possibly be recorded. We have not, of course, got all we want. Who has? But everything that could reasonably be granted we have had cheerfully and ungrudgingly; and because as a person who has consistently endeavoured to obtain what can be got, I have naturally advocated reduction of taxation and improvements in the means of communication, it does not therefore follow that I should fail to own, and be glad to own, that our Governors have been ever good and kindly men, who did all they could for us, as members of that community, which was committed to their charge.

"Having thus said something of the way the Government has got on with us, it now remains to say a few words as to how we got on with it, and with the officials who represent it. And here I find that we have very little to say. We have always got on with Government officials, and they have always got on with us. The fact was, we recognised our position, and did not talk about our rights. In truth, the British settler in India has no business to talk about his rights at all, or to magnify his importance in any way. I can easily see that the infusion of a few energetic Europeans can start a new industry, and give an impetus to every sort of industrial enterprise; but when people talk about settlers strengthening the hands of Government, it seems to me that something extremely like nonsense is being uttered. I can quite understand the presence of a few scattered settlers, or rather capitalists (for to call us settlers is a mere misnomer) weakening the hands of Government in troubled times, and I can quite understand the tendency often shown to make a great fuss because roads and works are not undertaken which are to benefit the Britisher in isolated situations, and enable him to get his produce to market; but what strength is to accrue to Government I am really at a loss to understand. Nor does it require more than a moment's reflection to see that supposing disturbances to occur in Mysore, there would be a tremendous hawl raised if the Government, at the first sign of danger, did not detach troops to secure the safety and property of planters in the province. In Mysore, however, I think the planters have recognised themselves at their proper value, and for because they have done so, do I think that the Government has been all the more disposed to do what it could for them. And here I may be allowed to hint for the benefit of Indian settlers in general, that there is a great deal in the way of putting things, and a great deal also in selecting judicious times for introducing one's wants to the notice of the official mind. An idea that may seem unreasonable and troublesome during the worry and heat of the day, or even after the fatigues of the day are over, will appear far from being either the one or the other if introduced after breakfast. Supposing then that the official of your district is going to pay you a visit, you should be careful to have everything prepared in the way of comfort that you can possibly think of, and make no mention of anything that you and your neighbours want till breakfast is finished. Then, when the official, refreshed with his bath and comforted by his breakfast, throws himself back in his chair and lights his cheroot, and when he has smoked the pipe of peace for about three minutes, then is the time to hint of that new line of road that you want, of the advantages that would arise from the improvement of a road that perhaps stands much in need of it, or of the erection of a bridge which would add materially to your comfort and to the value of your property. At those moments the official mind is more thoroughly open to the reception of truth than at any other time I know of, and if in these precious moments you cannot successfully insinuate your wants, you may depend upon it that your demands must be very unreasonable indeed.

"Another hint I may be allowed to offer is, that a settler should, above all things, manage his affairs without constantly applying here and applying there for Government assistance, and especially for regulations which may aid him more effectually in apprehending runaway coolies. The fact is that improvements in the methods of apprehension lead to no good result, and only end in plantation-managers being more careless than ever in making advances without the adequate security or sufficient inquiry into the character of the people to whom advances are made for the procuring of labour. My managers in India have standing orders on no account to go into a Court; and I do not think that within the last ten years either myself or my managers have ever been in a Court except once, and that was with a view of recovering a few advances from people who had undertaken to procure labour from a distance. In fact, since my estates were started in 1855, though I have advanced sums from a few shillings per man up to £5, and even more I do not think I have lost in all that time, more than £40 or £50, and some part of that sum was on account of deaths. Where the means of apprehension are ready and cheap, planters will advance sums of money to men whom they know nothing of, to procure labour; and I have known labour procured in this way all the way from Bangalore (one hundred and forty miles distant) the man employed to procure the coolies picking up anyone he could find, without caring anything at all as to character. The coolies arrive, and shortly after bolt to Bangalore; then the planter has the men apprehended and posted out to the estate, merely to bolt again on the next opportunity. Now this carelessness naturally puts the officials of all classes to more or less trouble, and I need not therefore say more as to the advisability of resolving to manage your affairs without any Government aid whatever."

According to Mr. Elliot then, it is generally the planters own fault if labour is deficient. In a chapter specially devoted to "Native Labourers," our author returns to the subject, and lays down the following five rules, which he explains and illustrates at great length, to regulate the general conduct of an employer of labour towards the people on his estate :—

1. As to your general conduct in the treatment of "coolies, be not all gall, or they will spit thee out, nor all sugar, or they will eat thee up."
2. Neither believe, nor what is of quite as much importance, disbelieve anything you hear until you have some independent evidence as to its truth or falsehood.
3. Be patient, and show all willingness to satisfy every man that his account has been correctly settled.
4. Be careful to discriminate between your people—between the good and the bad, the idle and industrious—and treat them accordingly.
5. Resolve never to go into a Court with your people.

Our readers will agree with us that there is much plain good sense in these rules; and that Mr. Elliot himself acted consistently in accordance with their teaching, and found them answer is proved by the prosperity with which he has been rewarded. The sum and substance of all his counsel is that no Englishman can hope to get on in coffee-planting, or we may add in any other business in India, unless in his personal relations with the natives he is careful to remember that they are human beings who are sensible of the value of kindness and justice. Tact and temper are, therefore, no less useful to the coffee-planter than a knowledge of the values of various manures, and of the differences of climate which make it advisable to grow coffee in the shade in Mysore and without shade in Ceylon.

Labour, however, is not so plentiful as it used to be in Mysore, but Mr. Elliot declares that wherever it can be procured in sufficient quantity—and it is the planter's business to choose ground with a safe labour market—"it can hardly "be so dear as to prevent coffee paying. It pays very well

"in Ceylon at ten pence a day, and there is no reason why it should "not pay elsewhere." At the transport, Mr. Elliot believes that "by the time a man has proven sufficiently to carry, he will find "roads overlooking him in very opposite directions. So many con-"siderations, political as well as commercial, exist in favour of "opening out the country, that at most any place, however inac-"cessible at present, has a fair chance of being soon within reach "of a road." The perusal of Mr. Elliot's book convinces us that the prospects of coffee-planting in India, though for a time over-clouded, are beginning to brighten again, and that as a regular branch of agriculture it will pay reasonably well, though the time for rapidly making great fortunes out of it has gone by. We conclude with a bit of useful advice to young planters :—

"In my opinion, planters have very much neglected the cultivation of many plants that might be grown along with coffee. I must plead guilty, to a certain extent, of having followed the example of my neighbours, but that is no reason why I should not point to what I conceive to be the common error. I mean then that planters should put down cinchona plants amongst the coffee, and in any corner that will hold a few trees, that they should cultivate the swampy ravines with cardamoms; and that they should plant up the margins of their lands with sandal-wood trees. 'Be aye sticking in a tree, it will grow while you are sleeping,' should never be forgotten. You think you will soon make your fortune and retire. But years and years slip by, and you do not or cannot retire, and then you think, 'If I had only stuck in this tree or that tree it would have, in the long run, added much to the value of my estate.' Thus I think of cardamoms, cinchonas, and sandal-wood trees now, and I would therefore impress upon the young settler, the necessity of doing what I and so many others have persistently neglected."

ESTATES IN COORG.

In his "Manual of Coorg," lately published, the author, the Rev. J. Richter, after enumerating the dire calamities that clouded the once splendid prospects of coffee cultivation in Coorg, goes on to say:—"There is, however, no cause for despair. The soil and climate of the country seem eminently suitable for coffee cultivation. Coffee may yet succeed in Coorg, and the undaunted planter may yet have his reward, if the method of cultivation, best suited to each locality, is carefully adopted, and if, with the increase of jungle vegetation, especially that of bamboos, better seasons may be expected to return and the white borers to disappear." Mr. Richter's, and his is surely every planter's most cherished hope—seems to be in a fair way of being realized. The crop of the last season has, indeed, proved a most satisfactory one in some instances, even beyond expectation. The total result of the crop exported from Coorg is not yet known, but it is supposed to have been the largest yet sent away. The prospects of the present season are again most satisfactory, indeed the weather has been so favourable during the most critical period of the year, from January till May, that the most fastidious planter should have his wishes satisfied. The amount of rain all over Coorg during the last four months has been unprecedented for the last nine years, as will be seen from Mr. Richter's metereological register :—

Anno.	January.	February.	March	April.	Total.		
1863	0·0	0·0	0·45	1·25	1 Inch	70	Cent.
1864	0·0	0·0	0·0	1·52	1 ,,	52	,,
1865	0·0	0·0	1·23	2·50	3 ,,	73	,,
1866	0·0	0·0	0·00	1·67	1 ,,	63	,,
1867	0·0	0·0	2·79	1·46	5 ,,	16	,,
1868	1·38	0·0	1·38	7·02	4 ,,	64	,,
1869	0·0	0·0	1·22	2·12	3 ,,	34	,,
1870	0·39	0·0	3·54	9·10	4 ,,	62	,,
1871	3·74	0·56	0·72	6·41	10 ,,	08	,,

This unusual amount of rain during the hot season proved of incalculable value to the planter for his nursery beds, and the general growth of trees which are consequently in a magnificent condition, but the growing space of weeds, adds not a little inconvenience at a time when the estates are almost without coolies. During this season there were three distinct and general blossoms; one in January, the other in March, and the last in April, and every one was of a fertile character; so that the forthcoming crops will probably surpass the last!

It must, however, not be overlooked, that though the coffee season promises so well, a considerable percentage will have to be deducted from the expected crops in consequence of the destructive operations of the "coffee borer," who has re-asserted his presence to a most lamentable extent, especially on estates, where radical measures against the borer-pest have not been taken in proper time, or where the proprietors of bored estates are not yet alive to the serious consequences of a *laissez faire* policy. There cannot be any doubt as to the borer's established position in Coorg, but we must not allow him an undisturbed abode; our tactics must aim at neutralizing and checking his destructive career, if we cannot entirely dislodge him; and to this end the planter, whilst called upon unsparingly to sacrifice every bored tree, should not have entirely or chiefly to rely for his crop on old coffee, but have to look forward to continuous reserves of young coffee coming into bearing. In fact, the working of an estate profitably will resolve itself into a constant partial renovation of the plantation, wherever the borer is largely at work. Quinnovating will be of great use, but perhaps more so the replanting of a portion of the estate where bored old trees predominate.

MANURE FOR COFFEE.

The *Madras Mail* has been favoured by Mr. F. Pogson, of the Punjab, corresponding Member of the Agri-Horticultural Society of India, with the following interesting communication :—

"The *Indian Economist* of the 15th ultimo contains a list of coffee, tea, and cinchona plantations extant in Southern India. The names of the proprietors and agents are also given, but without a Madras Directory, it would be impossible for letters to be properly addressed to them. Under these circumstances, I have thought it advisable to address the coffee planters of Madras and Ceylon through your columns; and as the subject is one of importance, I trust you will be so kind as to accede to my wishes. Since May last, I have perused various letters in the *Indian Economist* on the subject of coffee planting and manuring; and from their perusal, I have arrived at the conclusion that Indian coffee planters are not yet quite acquainted with the art of manufacturing a suitable manure for coffee. The various substances used as such are certainly manures, but by no means intended for the coffee plant. What coffee requires is a compost, which will easily dissolve in water, (after being applied as a top-dressing to the soil), and so be carried down within reach of the roots and rootlets of the growing plants.

"It may perhaps not be generally known, that the best manure for a plant is a solution of itself; and as this is not always forthcoming, the next best manure is an imitation thereof or a something which contains the elements or constituents of that plant; and as these are chiefly mineral matters, which are present in very small quantities in cowdung, it is unreasonable to expect first-class coffee berries from leaf-forming plant food, and cowdung is famed for its leaf-forming properties. We know from analysis that the best 'Java coffee' is remarkably rich in magnesia, of which cowdung does not contain even a trace, and as a consequence the growing coffee plant suffers from the deficiency. The common salt and sulphuric acid so largely present in coffee, cannot be provided by cowdung, nor yet can it supply the very large quantity of potash needed by the leaves and berries of this plant. A consideration of these facts will show, that in order to grow coffee to perfection, a compost must be used, in which all the mineral matters needed are freely and fully present.

"It is in my power to inform all concerned how to make such a compost, but prudence forbids that I should, as a rule, sacrifice my interests for the welfare of others; therefore I would wish to know, whether the coffee planters of Southern India and Ceylon would enter into a compact to remunerate me for giving publicity to my method of making coffee manure. My proposition is that a Committee of coffee planters be elected with whom I may communicate. The Committee to arrange the question of remuneration and to decide beforehand whether it may be claimed at the gathering of the first or second crop of berries. As the ordinary produce of coffee per acre per crop is pretty well known, the increase in quantity and quality will determine the value of the manure, which I may add is within the means of all. The process of manufacture is so simple, that any native of ordinary intelligence could prepare it, and as the manure does not spoil from keeping, it may be made at leisure and pleasure. In Ceylon, the manure may be made at a very low cost, as the components are there abundant and cheap; whilst at Madras they must continue to be higher priced, till the obstacles in the way of improved agriculture are removed by Government.

"I give beneath an analysis of coffee, from which you will see that unless the mineral matters named are present in the soil and manure good coffee cannot be produced. The deterioration of coffee plantations is due to the plant having exhausted the soil from constant cropping without proper manuring. The longest purse will be emptied if money is always taken out of it and nothing ever put in; and in like manner, the most fertile coffee soil will fail if it is similarly treated :—

Analysis of best Java Coffee (Lehmann.)

Potash	61·45
Lime	3·58
Magnesia	8·07
Per Oxide of Iron	0·25
Phosphoric Acid	10·02
Sulphuric Acid	4·01
Silicic Acid	0·73
Carbonic Acid	20·01
Salt Culinary	1·08
Soda	0·00
Charcoal and Sand	0·49
	100·00

With reference to the foregoing remarks, the following notes on manuring by Dr. Sortain, which appeared in a recent number of the *Ceylon Observer* are of interest :—

1.—There is a scientific idea which, if popularized, might be of service in the discussion of coffee manuring, it is chemical absorption.

2—When water is applied to perfectly dry earth, a certain definite

portion is absorbed and becomes latent; beyond this point the moisture is sensible. Ordinary drying by sun and wind will drive away the sensible moisture, but it requires a high degree of heat to drive off the latent, or, as it is called, the water of absorption.

3.—Gases as well as fields are subject to this law of definite absorption.

4.—When the food of plants is brought to the soil by rain, the upper layers absorb it up to saturation. What is over is carried to the lower layers and there absorbed, and so on, as far as the soil is permeable, down to the stagnant moisture. If there is more than enough to saturate the whole, it passes off to waste, as far as the soil on which it fell is concerned.

5.—If, however, the rain cannot pass freely off, as in swampy lands, it stagnates; and when, as the season changes, the water is evaporated by sun and wind, the fertilising matter is left behind in the soil not chemically absorbed, but in solution in the sensible moisture.

6.—This fertilising matter, as the ground dries up, is given up to the atmosphere and renders the country unhealthy. When land is drained it becomes fertile and malaria disappears, the fertilizing matter can now be chemically absorbed by the soil.

7.—When organic matter is left to decay on the ground rain takes what is soluble down into the soil, where it is absorbed up to solution. This is the way in which wild vegetation is supplied with fertilizing matter, and as the whole mass of roots derive the benefit, it is the best way, provided the fertilising matter is not dissipated in the atmosphere, or carried away by floods.

8.—The vital force of the rootlets is able to overcome the chemical force of absorption, and due exercise of the function increases the power of the tree to take up its food, as muscular exercise increases muscular power, and a good digestion is better than a good supply of nutritive soups.

9.—As the soluble products of decaying vegetable matter are carried down into the soil by the rain, as also the roots of the trees excrete effete matter, and as the rootlets themselves are shed like the leaves, the humus though being constantly used up is as constantly supplied.

10.—Terracing, tile draining, surface manuring, and thatching, appear to me the best methods of cultivating coffee, as far as the soil is concerned. The two first are expensive certainly, but then the present China-method cannot go on for ever.

11.—Terracing should be accompanied by draining, for the water having soaked through the upper terraces will have lost all value, and should be led off at the sides.

COFFEE ESTATE MANURES.

Juxta Nubibus' Estate, August 12th, 1871.

DEAR MR. EDITOR,—I beg to put a simple question to any of your old or experienced planting friends, because I have seen from different methods of action, that there is a difference of opinion between planters in the very outset of coffee-planting. Whether in making a nursery from a piece of good jungle well exposed to the sun and on the face of a hill, is it advisable to fell all the large trees, or merely the small ones, leaving the large trees about 20 or 30 feet apart for shade? And while I am at it, may I ask what quantity of parchment is required per acre? An answer will oblige.

ONE IN HIS FIRST YEAR OF CROP.

SURFACE *vs.* DEEP MANURING.

To the Editor of the Ceylon Observer.

DEAR SIR,—I would say a word or two on the subject of manuring of which a good deal has been written of late, and though from a planter even younger than P. T. O., * you will I hope find a corner for it. Surface and sub-soil manuring have each their advocates, and much that is good and useful has been said on both sides. I am inclined, however, to think that a good plant would be, on estates manured, say once every three years, to apply the manure in deep holes one year, so as to induce feeding roots down the tap-root; and near the surface the third year to form feeding roots there. An accurate account of this would of course require to be kept. But this, on estates where manuring journals are in use, would be very simple. I can't think it advisable to apply manure actually on the surface, be the land drained ever so well, as, no doubt, much is lost by wash and other causes. I have seen pulp applied as described by P. T. O., and, though the land is carefully drained, yet I saw much washed into the drains and on to the roads, and of what remained, any that was not perfectly covered was dry and shrivelled, and this too in a wet district, not 25 miles from Kandy, where we have not seen much sun lately. Let the manure be even put in holes 6 inch deep, and it will I consider be sufficiently near the surface, and can be covered so as to save it from being dried up or washed away. To apply manure as P. T. O. suggests, hand-weeding is absolutely necessary: and, there is no doubt, that though there are estates sufficiently clean to allow of hand-weeding; yet there are many more on which it is impossible to do away with cuscuda—I say some only.

July 10th 1871. E. M.

* The signature "P. T. O." should have been "A Superintendent Proprietor"—the mistake arising from the intelligence of the compositor, who having arrived at "yours faithfully" did not consider 'P. T. O' as a friendly intimation of the fact that the real signature was on the reverse of the sheet! Our correspondent writing in a suprise strain at being dubbed 'P. T. O.'—so opposed to his theory, too which in the case of applying manure is anything but turning over—points out, that in another part of the letter (5th line) the word "manures" should be "manurers," *post* three years, '*post* three years;' old more, should be 'old and more.'—The P. D. was evidently at work, which we regret.—ED. *C. O.*

SEASON REPORT FOR JUNE.

Madras Presidency.

THE rains during the month were abundant in Ganjam (5·60 inches) and the Nellgherries (4·24 inches) and very abundant in South Canara (40·20 inches) and Malabar (27·02 inches). In most of the other districts, there was an average fall of rain, the smallest falls were in Nellore (0·62 inches), Tinnevelly (0·87 inches), and Salem (0·99 inches).

Growing crops, gingelly, raggy, cotton, oil seed, and sugar cane, are said to be doing well in all the districts, excepting in Nellore, and Kurnool, where they are withering from want of rain, and in Cuddapah where they are being attacked by blight.

Crops harvested during the month, indigo, cholum, gingelly, &c., have yielded well in Nellore and South Arcot, but not so satisfactorily in the other districts; those in Trichinopoly, and Ganjam, yielding very indifferently. Prices in most cases are stationary, or slightly inclined to fall; paddy has ranged during the month from 85 rupees a garce (about 150 bushels) in the Godavery district, to 154 rupees a garce in the Tinnevelly and Kurnool districts, the average being rupees 116; cholum, from 91 rupees a garce in South Arcot, to 184 rupees a garce in Madras, the average price being rupees 143; raggy, from 87 rupees per garce in Salem, to 176 rupees in South Canara, the average price being rupees 125; horse gram, from 127 rupees a garce in Godavery, to 227 rupees a garce in South Canara, the average price being rupees 169.

In several of the districts, cattle diseases are prevalent, though grass and water are abundant.

MARKET REPORT.

TEA.—LOCAL SHARES.

	Capital.	Dividend per cent.	Share par value.	Last quotations.
Adulpore Terai Tea Coy.	1,10,000	12	100	102
Darjeeling Terai Tea Coy.	1,00,000	..	..	..
Kurseong and D. Tea Coy.	8,00,000	8-10	25	95
Punkabarree Tea Coy.	2,50,000	8	100	85
Soom Tea Coy.	3,00,000	5	100	120
Tukvar Tea Coy.	10,07,180	..	20	109

CALCUTTA, *Tuesday's Overland.*

Four public sales have been held during the week, at which 4,091 packages were presented, and 3,291 were sold the remaining 791 chests being withdrawn. All strong and desirable teas fetched full prices, especially Pekoes and broken Pekoes, whilst thin Cachar kinds attracted rather less attention at a slight reduction in rates. An invoice of 235 chests Central Cachar were disposed of privately at 12 annas 9 pies per lb. average. The home market is still very depressed. Imports and deliveries remaining very much on a par for the first six months of the present year with those of the previous one. This is rather discouraging to those who anticipated any considerable improvement in this years' consumption, which so far has not gone on advancing at the same proportion as during past years. Further sales are advertised for incoming week. For public sales, particulars:—

Prices paid at Public Sales held 7th, 10th, 11th, 14th, & 16th August 1871.—Offered 4,290 Chests.—Sold 3,205 Chests.

Descriptions.	Bannockburn Estate, Darjeeling. Diamond G. Lebong, 31 Chests	Matigurrah Tea Plantation, Darjeeling. Matigurrah H Darjeeling, 11 Chests.	Selim Association, Kurseong. Selim Tea Association, Diamond, M. 218 Chests.
	Rs. a. p.	Rs. a. p.	Rs. a. p. to Rs. a. p.
Flowery Pekoe	.....	.....	..... " .....
Orange Pekoe & Pekoe	0 14 0	.....	1 1 6 " .....
Pekoe Souchong	.....	.....	0 12 6 " .....
Souchong	.....	0 10 0	0 12 0 " .....
Congou	.....	.....	0 8 6 " 1 1 6
B. Pekoe & B Black	.....	0 6 6	..... " .....
B. Leaf & Siftings	.....	.....	..... " .....
Average per lb. As.	0 14 0	0 9 8	0 12 7

TEA.—Unsatisfactory accounts have been received of the last sales of Indian tea held in London. Only 2,700 chests passed the hammer, out of a lot of 4,100 chests, at a decline of 1½d. per pound in common and medium sorts.—*Bengal Times.*

London, Thursday, August 17, 1871.

Rather more business has been done in the Colonial Produce Markets. Coffee has become dearer in consequence of the sale of the Nederlandsche Trading Company, which is reported to have reached 5s. per cwt. above valuation.

COFFEE.—The Dutch Company's sale of 135,000 bags Java, held yesterday, went off well, all selling at 1 c. to 1½ c. above the valuations; good ordinary bringing 56s. This favourable result has imparted great strength to the market, all qualities selling at firmer prices; and 640 casks, 127 barrels, and 400 bags of Plantation Ceylon all sold; triage, 53s. to 55s.; small to bold, 63s. to 77s.; peaberry, 81s. to 13s. 89 casks, 1,100 cases, and 1,000 bags of other East India nearly all sold; Native Mysore, 54s. to 55s. 6d.; Coorg, small to low middling, 53s. to 55s.; peaberry, 50s.; Nellgherry, small to bold, 63s. 6d. to 65s.; Wynaad triage 53s. 6d. to 60s.; small to good middling, 63s. 6d. to 75s. 6d.; peaberry, 67s. 6d. to 68s. 1,000 bags Manilla mostly sold, 44s. to 55s.; superior sold, 75s. 6d. 1,100 bags native Ceylon bought in at 60s.; and 200 bags Malabar at 62s.

TEA.—A Sale of 9,261 packages commenced on Tuesday morning; 5,200 passed, and about 4,000 were sold. Two small parcels new season's black-leaf were disposed of at fair rates—1s. 6½d. to 1s. 6½d. per lb. Other parcels, printed with "reserved prices" were withdrawn. Several breaks of common to fair Oolong sold at a reduction. Yesterday, about 3,700 packages found buyers. A chop of new season's black-leaf sold at 1s. 7d. to 1s. 7½d.—about private contract rates.

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

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ANSWERS TO CORRESPONDENTS.

"We intend to start a Farm to supply the wants of a large Cantonment, will you kindly give us your advice:— first,

"*What area should we occupy?*

One hundred acres of good loamy soil, one-fourth of this area, or about 25 acres to be "wet land." You should at the same time arrange that you may get 30 or 40 acres of the adjoining land should it eventually become necessary to extend your farm.

"*What Capital would be needed?*

About 7,000 rupees, to be expended in the following manner:—

Permanent Improvements.

	Rs.	A.	P.				
Levelling, Fencing, Road making, &c.	1,500	0	0				
a—Buildings	2,000	0	0				
				3,500	0	0	

Tenant's Capital.

b—Working Cattle 20	600	0	0				
Feeding Cattle 25	300	0	0				
Sheep 100	200	0	0				
Pigs and Poultry	150	0	0				
Implements and Carts	600	0	0				
c—6 Months' Labour Bill	800	0	0				
d—6 Months' Food for Stock	500	0	0				
Manure	200	0	0				
6 Months' Rent	75	0	0				
Contingencies	75	0	0				
				3,500	0	0	
				7,000	0	0	

"*What will be the gross annual expenditure?*"

	Rs.	A.	P.				
Interest on Permanent Improvements, at 7½ per Cent	262	8	0				
Interest on Tenant's Capital at 5 per cent	175	0	0				
Rent	150	0	0				
Labour, &c.	1,600	0	0				
Food for stock	800	0	0				
Seed, manure, and contingencies	312	8	0				
				2,800	0	0	

"*Will such a Farm pay?*"

Yes, if conducted like any other business, on sound commercial principles.

(a)—Your will explain, a Cottage for the Overseer containing 3 rooms, the necessary outbuildings, &c. (Cattle shed containing 20 Bullock boxes; Sheep shed, Pig sties, Granary, Tool store, Poultry house, Cart shed, &c.
(b)—Probably supplied gradually first, a less number will suffice.
(c)—This includes an allowance of Rs. 20 monthly for an Overseer.
(d)—As you must purchase nearly all the food you need at first starting, this item is perhaps heavier than it need afterwards be.

I wish to grow yellow Cholum (Holcus Sorghum) as a fodder crop. At what stage in its growth should I cut it? And how many crops of fodder will one sowing yield?

Cut it just before the flower appears, or what is better, when about 1rds grown. If you cultivate between the rows, and can occasionally water it, you may get 6 cuttings during the season, giving a total yield of about 25 tons per acre, but this greatly depends on your soil and manure. Under dry cultivation you may expect 3 cuttings at least in the season. It is best to sow with the rains.

Last season I put down yellow Cholum for fodder: I obtained two good cuttings when the rains commenced, when, contrary to my natural expectation, the crop entirely failed; how do you account for this?

The explanation is very simple, you cut through the thick tubular stem of the cholum, thus forming a verticle tube in which the rain water collected, and this water remaining for some time gradually rotted the stalks and killed the plants.

I wish to sow some cotton seed, is it necessary that I should confine my sowings to black soil.

Certainly not; if you can get plenty of manure, almost any soil will yield a fair crop of cotton. We noticed in the Report of the Madras Experimental Farm that a soil containing as much as 90 per cent. of sand yielded, last season, 120 pounds of clean cotton per acre, while the average of the Madras Presidency is only 70 pounds; but unless you can get manure, you had better confine your sowings to the black soils.

When would you sow Carolina Paddy seed? Would you transplant or sow broad-cast? In either case, what seed is needed? How long would it be before the crop was ready for harvesting? What is fair yield of straw and grain?

We must answer you briefly, as you do not mention where your land is situated; we answer, generally sow at the time when it is customary to sow country paddy in your district. You must decide for yourself whether to sow broad-cast, or to transplant; as a rule, it is less costly to sow broad-cast, but broad-cast crops are irregular and are always longer on the ground. We prefer to transplant. For broad-cast sowing you will require about 45 pounds of seed per acre; for transplanting about 25 pounds of seed per acre. A broad-cast crop would require at the least 5 months to reach maturity. A transplanted crop would be ready for the sickle 4 months after planting. A fair yield is about 3,000 pounds of grain and 5,000 pounds of straw per acre.

I have a fat bullock that weighs 400 pounds, if I kill him, what weight of beef may I expect?

Assuming that the bullock is in good condition, and that the weight you mention is its gross live weight, you may expect to get about 164 pounds of good marketable beef.

What is a fair daily allowance of food for a pair of working cattle?

5 Pounds of grain (maize, cholum, gram, coimbu, &c.)
5 Pounds of oil cake.
80 Pounds of straw (maize, cholum, gram, coimbu, paddy, &c.)

LETTERS TO THE EDITOR.

To E. Knight, Esq.,

Editor Agricultural Gazette of India.

Sir,—Might you not press upon the notice of Government, the propriety of their sending you Returns concerning the agriculture of every district of India similar to those you have just published from Berar. You might possibly induce them to direct the undertaking of such experiments in every district: the results to be annually made public, in one prescribed form, and attached as an appendix to the annual Administration Reports when it would be available to all.

In addition to what has been given in the Berar returns, columns, should be added, showing the rental paid for the land experimented on, and the costs of cultivation (1) Ploughing, (2) Harrowing, (3) Sowing (4) Weeding, (5) Draining, and any other, &c. With such data available, deductions of some value would be possible. Believe, &c.

X. Y. Z

THE MASTER'S EYE MAKES THE HORSE FAT.

To the Editor of the

Agricultural Gazette of India.

DEAR SIR,—I send you a specimen Report of a Coffee Company, Limited, in which I have an interest, in the hope that you will be able either yourself and by some of your correspondents, to show up the extravagance of the working expenses in the hands of an Agent which preclude the possibility of any dividend. You will suppress the name of the estate of course, and all matters and references indicating the locality or parties concerned. No imputation is implied. The system must be exposed, which brings Companies to grief. I have no hesitation in saying that the estate has been systematically done, and that the proprietors have not had "*the pickings* except, perhaps, for one or two years of late." No very reliable data have ever yet been given as to the ordinary cost, including management, weeding, pruning, and handling, *per acre*, and curing, pulping, garbling, and all the expenses *per ton* of getting in a crop. Some approximate estimate is much wanted, and as you are devoting the columns of the *Agricultural Gazette* to an analysis of the industrial resources of India, I trust that the large subjects of the management and economical working of coffee estates may find a trustworthy exponent of first principles under you auspices. —I am, dear Sir, yours faithfully.

A VICTIM OF AGENCY.

Dr. The Balance Sheet of the "SHUCK" COFFEE COMPANY, (Limited), *made up to 1st April* 1867.

CAPITAL AND LIABILITIES.

	Rs. A. P.	Rs. A. P.
Capital.		
Due to the Shareholders on 2000 shares of Rs. 50 each		1,00,000 0 0
Debts and Liabilities of the Company.		
For balance of advances	8,433 0 0	
Due to Messrs. D'Souza and Co. for garbling crop and other charges	2,109 7 8	
Due to the Jackals on the Estate	800 0 0	
		10,892 7 8
Total...		1,10,892 7 8

I hereby certify, to the best of my belief, that the above contains a true account of the Capital and Liabilities, and of the Property and Assets of the "Shuck" Coffee Company (Limited), as the same stood on the 1st April 1867.

T. NEWMAN, *Auditor.*

Cr. PROPERTY AND ASSETS.

	Rs. A. P.	Rs. A. P.
Block.		
Cost of the Block of the Estate		82,200 0 0
Crop 1866-67.		
Estimated value of the season's crop on 100 acres 33 tons, at Rs. 540 per ton	18,481 7 0	
Less Advances obtained upon it	8,038 1 0	
		10,443 6 0
Debts owing to the Company.		
Advances made at the Estate		620 12 0
Cash.		
In hand		836 4 9
Profit and Loss.		
Balance at debit thereof being losses for few years		16,701 14 11
Total.. ..		1,10,892 7 8

We do hereby certify, to the best of our belief, that the above contains a true account of the Capital and Liabilities, and of the Property and Assets of the "Shuck" Coffee Company (Limited), as the same stood on the 1st April 1867.

F. THOMAS, H. MANBY, } *Directors*

Analysis of the Expenditure upon the "*Shuck*" ESTATE, *for the year* 1866-67.

	Rs. A. P.
Advertisements	11 13 0
Agency	1,500 0 0
Audit	50 0 0
Barbacue	114 14 0
Buildings	539 15 0
Crop Picking..	1,511 3 8½
,, Curing	216 9 0
,, Carriage	741 0 0
,, Garbling	1,710 3 11
,, Sundries	133 4 0
Interest on Mortgage	621 15 6
Land Tax	266 0 0
Loss of Grain	42 13 0
Manuring (one row of cabbages and 3 of knol-khol)	57 15 0
Medical Expenses (Quinine and Port-wine for the coolies)	70 7 0
Miscellaneous (Jew's Harp and Ice Machine for Supt.)	335 5 3
Money charges on Remittances and registering love letters	105 12 0
Pitting	94 12 0
Printing (said Love Letters and for all Planters) ..	49 0 4
Pruning (including almonds, raisins, and cosquos)	984 6 0
Roads and Fencing (and Quolts)	123 4 0
Stamps (on said letters)	53 0 0
Stock (including Albert neck-tie)	97 4 0
Superintendence (from the Bungalow)	2,700 0 0
Telegrams (from party to whom said letters were sent)	13 0 0
Tools (chiefly walking stick and umbrellas).. ..	112 15 4
Transport (General), including a Bath chair for the Superintendent	219 0 8
Weeding, including cheroots for 20 coolies daily ..	2,062 8 6
Total..	14,514 8 9½

	Acres. R. P.
Fully Planted	100 0 0

To the Editor of the

Agricultural Gazette of India.

SIR,—In your No. of 21st August is a description by Lieut. Colonel Boddam of a light plough made of wood and wrought iron, weighing only 70 lbs., and so simple as to be capable of being repaired or even made entirely in any village in this country that contains a blacksmith. From its description I was so struck by the evident suitability of the plough to farming here that I attempted to get one from a leading mercantile firm in Bombay, who I believe import things of this kind, but am sorry to say they tell me they never heard of it, and can find no description of it in Ransome and Sim's Catalogue. Could you or any of your readers give me information as to where one is to be had

Khandeish, 26th September 1871. PEAR.

Note by Editor.

Apply to the Superintendent of the Government Farm, Madras.—ED. A. G.

SHUCK COFFEE TREES.

To the Editor of the

Agricultural Gazette of India.

SIR,—A Superintendent in Wynaad, whose attention I called to a conversation in your issue of the 15th July, between a Planter and a "*Shuck Coffee Tree*," says of that letter! "I have now been a planter for over nine years, and I am able to give "Shuck Coffee Tree" a wrinkle or two. I have read the letter in the *Agricultural Gazette* of the 15th July. The tree seems to have got the better of its master, and I don't wonder at it; he seems to know very little of the management of coffee. The tree complains of being starved; of having its roots cut off; its food put at such a distance that it can't get at it; of the earth being scraped away from its roots; and sundry other things, which *no one calling himself a Planter would do*. The letter itself is a very good one, but it is intended for young planters, or men of little experience in coffee, not for men who have been planting nine or ten years. I could have told you eight years ago all that you have just seen in print." This is meat for babes, Mr. Editor; something stronger than that is required for Wynaadians, who know pretty nearly everything about coffee, except making it pay.—Yours faithfully,

A SHUCK PROPRIETOR.

HIMALAYAN ENTERPRISE.

TEA CULTIVATION, No. IV.

To the Editor of the

Agricultural Gazette of India.

SIR,—In my last I calculated the planter's expenses up to the end of the first year or year and a half (allowing four or five months for prospecting land, &c., before commencing operations) which, "liberally estimated," amount to Rs. 8,000.*

Some "high pressure" developers may aver that my planter takes it rather easily, when, after eighteen months he has only managed to house his cattle and get a nursery of two acres sown with tea seed, but according to my experiences, he had better take *two years* (or even *three* for that matter) so long as what he does is *done well* than "Go ahead" "Jack of all trade's fashion," making, as a matter of course a hash (or "a hat" as people say now-a-days) of everything. This is, or rather was, the way we went to work when we first commenced, and we have lived to be sorry for it.

We were to have 50 acres cleared and planted every year (counting from the day we started) the great thing, and the only thing being, as was confidently affirmed, to get "a large area," in fact "the largest possible area," speedily under tea.

We were consequently busily and industriously (?) employed. Everybody was building a large bungalow, ditto. a large factory, clearing 50 acres of forest against next year, planting 50 acres of forest cleared last year, (buying seed and plants to enable him to perform these feats at fancy prices), making roads, building temporary huts for 200 or 300 men, &c., &c., &c. ALL AT ONCE, the result being that not one of these operations was performed properly, or if one was, the rest were neglected, while *all* cost three or four times the proper amount.

"Going ahead" is all very well when you know the road you are going, have gone it often before, and seen where it leads to; but if you don't happen to possess this knowledge, you may just as likely as not "take a wrong turn," in which case "going ahead" is just what brings you to grief.

Festina lente is a *safe* motto at all times and under any circumstances, but in new or little understood enterprises it is *indispensable*. This we discovered later on to our cost, I therefore take the liberty to recommend deliberation to all future developers, after which piece of advice, I will resume my description and abandon my digression.

Early in the spring of the second year, the planter should select ten acres of land close to or as near as convenient to his cattle houses, clear the same of trees, shrubs, and bushes, by cutting them down, allowing them to remain on the ground till thoroughly dry, and then igniting them (the large trunks and limbs which won't burn being afterwards rolled off to the sides to make a hedge).

The ten acres should then be carefully terraced, the terraces averaging not less than twenty feet in breadth, all the stones, roots, &c., taken out,

* For a plantation of 100 acres.

and the ground thoroughly turned over and broken up to the depth [illegible] (300) [illegible] the [illegible] of the [illegible] to the [illegible]

If [illegible] it will suffice to put [illegible] when these are planted [illegible] the great quantity during the ensuing cold weather [illegible]

The [illegible] down in the nursery (as described in my last) will not be ready to plant out; seedlings (in the Himalayas) [illegible] ready to be put out under two years, and being perhaps not at their best until three years old.

The planter will, however, in all probability find no difficulty in purchasing a few lakhs at moderate rates.

At the rate of 3,000 plants or bushes per acre, and of six seedlings to a plant or bush, which is the usual practice, and allowing for the undersized or sickly ones or those with injured roots being rejected, 3 lakhs or 300,000 seedlings will be sufficient for ten acres.

These should be carefully planted (during the month of July) in holes eighteen inches in diameter and proportionately deep, and should be set six inch lower than they stood in the nursery, I prefer three feet apart (on well manured ground), and ditto. between the rows.

This job finished, the end of the monsoon approaching, and the ten acres having been roughly fenced in, the planter should begin to think about building a factory.

Natives dont work well in rainy weather, so I should recommend nothing being attempted, except what is absolutely necessary, (and consequently no more hands than are required for planting the ten acres entertained) until the close of the monsoon, but the moment the fine weather sets in (in September) affairs should be got under weigh.

If being in a hurry generally is bad, building in a hurry is perfectly ruinous. The expense of building (in the mountains, where as yet there are no cart roads or carts) depends almost entirely on the carriage of the materials.

If you can find a quarry close alongside your site, or find a good site close to a quarry, and timber "handy" you can build cheaply enough. If your quarry is half a mile off, and timber two miles, as sometimes happens, you will build dear.

Your choice of a site should therefore be guided to a great degree by the propinquity or otherwise of the necessary raw material. As a rule you can dig nowhere in the Himalayas, without coming to a quarry of some sort, good, bad, or indifferent, before you have dug a couple of yards, and it may be taken for granted that a tolerable quarry exists somewhere or other on every plot of 300 acres, also good timber for building, i. e., on any plot likely to be chosen for tea cultivation.

The planter should first fell his timber (in the autumn) leaving it on the ground for six months or so to season.

While it is seasoning, and subsequently while it is being cut up (on the spot where felled) into beams, planks, door posts, window frames, &c., &c., he should quarry and collect stones for building on the proposed site, for which purpose he can either employ forty or fifty men (each man being *supposed* to carry 30 seers to a maund of stone from the quarry to the site, but in reality not carrying above ten) on the old method, or he can make a road from the quarry, lay down planks, and run the stone in trucks and wheel-barrows, or in cradles on a wire rope stretched according to the new.

The difference of expense is, it is perhaps needless to remark, something like two-thirds or thereabouts, in favour of the latter.

The collection of material for a first-class factory, with upper story godown, for storing 40 to 50,000 lbs. of tea, withering accommodation for 600 seers of leaf at a time, &c., &c., &c., should not cost, if properly managed, more than Rs. 2,000 or at most Rs. 2,500.

With regard to the ground plan or configuration of said factory, after inspecting a considerable number of these edifices, I have come to the conclusion that the best plan (for the hills) is a hollow oblong, (what the Irishman called an oblong square), the plan in fact of the old Indigo planters "kotee" of former days. The factory proper, which should be double storied, forming the head or upper end of the oblong enclosure, with no outer verandahs, their place and use being supplied by a large open *plinth* or verandah, running round *the inside* of the quadrangle.

These inside verandahs would contain the racks for withering the leaf.

The lower end should be closed with a wall and gateway, which should be the only entrance and exit to the place.

The verandahs on each side will be continued round to this door-way, and the inner face of the factory at the upper end also furnished with a verandah.

We thus have an oblong quadrangle, or enclosure, surrounded on the 3 lower sides by a high outer wall, and on the upper by the factory itself.

The area enclosed by the four outside or external walls should, for a factory attached to a plantation of 100 acres under high cultivation, not be less than 100 feet by 150.

This will leave a clear open space or yard in the centre of 126½ × 100 feet (allowing eighteen inches for the thickness of the inner wall of the factory).

The advantages of enclosing a factory in this manner are multifarious:

In the first place gusts of wind in dry hot weather dont blow dust, &c., into the leaf while in course of manufacture.

Secondly.—The warmth is concentrated and increased, consequently the leaf withers and ferments more evenly and quicker.

Thirdly.—It in great measure prevents pilfering of tea during manufacture, a practice which in large establishments sometimes prevails to a serious extent.

Fourthly.—The tea can be exposed to the sun, in the yard, with much better effect, and without the wind blowing the tea off the mats and trays, or overturning them.

Fifthly.—The expense is no greater than that of detached straggling factories, [illegible]

[illegible] of a long disturbance which may happen in the [illegible] and the [illegible] building in such situation (against a [illegible] by two or three [illegible] men, it being [illegible] to set it on fire (from outside) or to storm it without risking much greater loss than such outlaws are disposed to encounter.

The outer wall should be built of the thickness of the rubble available everywhere in the Himalayas, cemented with common clay, and chopped according to the local practice. This wall should, including plinth, be about 20 feet high outside.

The verandah running round the inside twenty-five feet in breadth, allowing for a double row of leaf racks.

The factory end should be double storied, but need not for all that be very lofty; a great deal of space and money has been wasted in building factories thirty feet high inside, and single storied.

Ten feet is quite high enough (from flooring to roof) for the lower story.

The roof of the upper story may be fifteen feet from the floor to the ridge beam.

The factory will be something like 146 feet in length by 30 feet in breadth (inside); there will thus be plenty of room for two large apartments to be walled off at one end (one upper room and one ground-floor) each 46 feet by 30 feet or thereabouts, in which the planter can take up his abode, thereby saving himself the expense of building a separate bungalow, and likewise the trouble of walking every day (perhaps in rainy weather) to the scene of operations.

In addition, the man knowing he is close at hand, or at any rate never being certain that he is not, will work twice as steadily. The entrance to the planter's rooms would of course be from outside, with a door communicating between the lower room and the factory.

The upper story of the factory above the manufacturing room should be fitted with lead lined bins for storing the made tea, and should also form a general store room for spare tools, mats, baskets, and other plant.

It should communicate with the manufacturing room by a large trap door and steps.

The whole edifice should be either zinc or iron-roofed or slated.

A row of substantial outhouses should be constructed adjacent, for the accommodation of the tea makers, coolies, servants, &c., &c.

Now for the accounts, cost, &c. :—

	Rs.	a.	p.
Row of out-houses for tea-maker's servants, &c.,	3,000	0	0
Collection of material for building factory, stone, felling timber, cutting, and squaring ditto.,	2,500	0	0
Cost of living of planter, 12 months, 100 Rs. per mensem	1,200	0	0
Grain for cattle during winter	100	0	0
Six herdsmen, 5 Rs. per mensem (12 months) ..	360	0	0
Carriage of grain to plantation	150	0	0
Cutting and storing grass for fodder	200	0	0
Clearing ten acres of land and terracing ditto..	600	0	0
Manuring ditto	50	0	0
Planting ditto.	100	0	0
Purchase of 300,000 seedlings, 2 8 per 1,000 ..	750	0	0
Carriage of ditto. from plantation	150	0	0
Purchase of tools, mamooties, axes, &c.	500	0	0
Odd expenses	300	0	0
Total Rs. ...	10,760	0	0
Brought forward from 1st year .	8,000	0	0
Grand Total ...	18,760	0	0

Or say in round numbers, up to end of second year, Rs. 20,000.

My description of the factory having rather out-stripped my chronology, I must here remark that the building expenses of the same would properly come under the third year, whereas I am now dealing with those of the second. I will now add up accounts for the second year, premising that I am in most of the items allowing a margin over and above what I believe, with care and economy, they would actually cost.

By the end of the second year the cattle should have increased at a moderate computation and allowing for losses to 100 or 120 head. Two or three additional herdsmen would therefore be requisite, also an increase of expenditure for grain and fodder during the winter, but the milk, if properly looked after, and made into ghee or clarified butter, and the amount realised after the stock has reached its maximum limit by sale of calves, will more than realise all extra expenditure. I.

EDITORIAL NOTES.

FARMERS in New Hampshire have a peculiar way of planting potatoes. They lay them on the ground and cover them with thatch, so that the sun will not burn them when they are said to be better in quality, and to grow in larger numbers. This is not a new mode. It is extensively and successfully practised in many localities in America, especially in districts subject to long droughts, if straw is plenty.

In our last issue, we made a few brief observations on certain extracts from the Proceedings of the Madras Board of Revenue on the use of salt for agricultural purposes. Unfortunately, our remarks were paragraphed along with the paragraphs containing the extracts from the Board's Proceedings. We wish it to be understood, that the first four paragraphs only were extracts from the Proceedings of the Board.

The food of their poultry is very carefully regarded by the French breeders. For the first week after being hatched (and in winter for a much longer time), the chickens are fed on barley meal mixed with milk, stale bread soaked with water, and green food finely chopped. Very few instances can be found where poultry are fed on whole grain, as it is believed that whole grain would be too expensive, produce fewer eggs, too much fat, and cause more disease when fowls are fed *ad libitum*, so as to completely fill their crops, which renders digestion difficult. The food is mostly composed of about one-half bran and one-half buck-wheat, barley, or oatmeal, made into a stiff paste, with which the fowls are fed twice a day, namely, at sunrise and sunset. This diet is given indiscriminately to old and young. In some cases where the fowls have not the run of meadows, they are provided with a certain amount of animal and green food. The waste of the butcher shops is boiled, the fat skimmed off, and when coagulated, thoroughly mixed with the meal food. Cabbages and other vegetables are supplied in some cases, being either fed raw, or boiled, and mixed with the other food. Buck-wheat is considered preferable to all other grain as a stimulant to egg-laying, and in winter a certain amount is given whole.

A summary of returns from the Agricultural Department at Washington, shows the average pay of farm labour in the United States to be a fraction over 25 dols. (50 rupees) per month, or very nearly 1 dol. (2 rupees) per day for the working time—perhaps over that, if due allowance was made for bad weather and other contingencies. In striking contrast, we note returns recently published as to the prices paid for agricultural labour in Europe. Thus in Belgium the price reported is equal to 8 annas and 4 pies per day without food, the variation being from 5 annas 9 pies to 12 annas 10 pies in extreme cases. Day labourers, in harvest, get from 1 rupee 3 annas 2 pies to 1 rupee 8 annas a day. One report from Prussia is about the same rates; two others are much lower, one stating the wages in summer and harvest at the rate of 4 annas 10 pies to 6 annas 5 pies a day without victuals, the other at 11 annas 6 pies for summer work in general. In Switzerland, prices vary from 4 rupees to 8 rupees per month with board, and from 1 rupee to 1 rupee 3 annas 2 pies a day without. In Galicia, labourers receive 5 annas 9 pies a day in summer, 3 annas 10 pies a day in winter, 7 annas 8 pies to 9 annas a day in harvest with no rations. In Silesia, men get board and lodging and 40 rupees a year. In Hungary wages vary very much, but are mostly paid in provisions, generally about 28 rupees a year in money, 60 bushels of grain, food for a cow and pig, and fuel and lodging free. In France, one report says 12 annas 2 pies a day in summer, and 9 annas 7 pies in winter without provisions; another, 120 to 140 rupees a year with board; another, from 8 to 12 rupees a month, and another gives a table of rates paid for piece work, in which we find—cutting hay, clover, lucerne, &c.; first cut, per acre, 1 rupee 10 annas 11 pies, second cut, 1 rupee 6 annas 5 pies, cocking the same, 10 annas 3 pies per acre; reaping oats, wheat, &c., with the hook, 2 rupees 9 annas 7 pies per acre; putting in sheaves not bound, 10 annas 3 pies per acre; binding, 5 annas 1 pie, per 100; hand-sowing cereals, 3 annas 6 pies per acre; spreading manures or lime, 11 annas 2 pies per acre.

In our last number of the *Agricultural Gazette* we published a memorandum by Lieutenant-Colonel Boddam on ploughs. We have since discovered that the facts recorded in the memorandum are drawn from the Report of the Experimental Farm at Madras, and it is but justice to the author of the Report that we should place the fact before our readers:—

Government Farm Report, dated April 1, 1871.	*Lieut. Colonel Boddam's Memo. in Mysore Gazette, dated July 1871.*
The Report at page 28 records the results of experiments with iron ploughs, and speaks favourably of certain small iron ploughs made by Messrs. Ransome & Sims, and Messrs. Howard & Co., and adds that they cost, in Madras, rupees 35 each.	Colonel Boddam recommends Ransome & Sims' small iron plough, and says they cost about rupees 30 each.
Para 210. A combined plough, that is one made of wood and iron, was made on the farm.	This combined plough only weighs 70 lbs., and could be made up at Madras Rs. 15; in a village would be made up probably for Rs. 10. It can be conveniently carried from field to field, and it is so constructed, that the driver while working is near his cattle.
Para 212. It is a swing-plough with wooden stilts and pole, and the whole of the iron-work, mould-board included, consists of malleable iron. We thus avoid the loss and annoyance the breakage of castings so frequently causes. Wherever there is a village smith, the plough can be made up or repaired. This plough only weighs seventy pounds, and can be conveniently carried from field to field, and it is so constructed that the driver while working is always close to his cattle.	
Para 217. The Native plough cuts out a triangular furrow, while the furrow made by the English plough is rectangular. The result is that while the English plough cleans out its furrow, and leaves the under surface level, the Native plough leaves a ridged under-surface, nearly half of the land being unploughed.	The Native plough cuts out a triangular furrow: the English plough a rectangular one; while the English plough cleans out its furrow, and leaves the under-surface level; the native one leaves a ridged under-surface, nearly half of the land being unworked.
Para 218. Again, the English plough inverts the soil and brings up each time a fresh surface, while the Native plough, or Cultivator, as it should be called, leaves the soil in its original position.	The English plough inverts the soil and brings up each time a fresh surface, while the Native apology leaves the soil much in its original position.

September 12th 1871.

Colonel Boddam no doubt made an oversight in omitting to notice the authority whom he was quoting Mr. Robertson of the Madras Farm.

CAN FARMING BE TAUGHT.

(From Nott's Guardian.)

Can farming be taught?—or are its secrets only to be penetrated by long years of experience? The answer to either question is, we believe, neither decidedly yes or no, and the truth probably lies somewhere between the two. In considering the subject of agricultural education, we can hardly insist too much on the difference between a knowledge of certain facts and practical experience.

Knowledge of facts may be acquired through observation from books and by mixing with men of practical skill. Experience must be personal, and extend over such a length of time as to bring us face to face with every difficulty that may beset our path. Hence, while a large amount of knowledge may be gained in a comparatively short time, an experience is only to be achieved by a lifelong service. In answering the question as to whether farming can be taught, we must exclude the idea of giving to the pupil a personal experience, with all its concomitant advantages, and consider only the best means of imparting the result of the experience of others in the form of well-ascertained facts bearing upon his future walk in life. To this theoretical part of his instruction must be added every opportunity for acquiring a knowledge of the daily routine of farm work, in which he also should engage.

First, it must be granted that a knowledge of facts, bearing directly on farming, will eventually be of inestimable value; or, in other words, that a period of tuition or at least of study, is essential to the future well-being of the farmer. It is true that at a recent meeting of the Royal Agricultural Society, a leading member of the Council spoke of the attainment of a great agricultural knowledge as easy that a man who had mastered certain abstruse and difficult branches of science would have little difficulty in conquering the details of farming. We do not agree to this. We believe that long and careful study is

required before an intelligent man possesses an extended knowledge of the art of agriculture, untrammelled by foolish prejudices, [illegible] to modify [illegible] under novel circumstances [illegible] a man [illegible] and that this particularly applies to [illegible] where [illegible] is profitable occupation.

We hardly think it necessary to trouble our readers with arguments [illegible] which all intelligent agriculturists allow, namely, that a training in practical agriculture is essential, a knowledge of [illegible] desirable, and that an insight into [illegible] of science, directly or indirectly bearing upon agriculture, is valuable to the young farmer. How then is this [illegible] of agriculture to be obtained? We do not know of any one place which provides for all these wants, and if a place existed, professing to meet the agricultural student and instructing him fully, scientifically, and practically, into the mysteries of his art, we should doubt its efficacy. No; the agricultural student must go through more than one phase of instruction, and he must be content to give a considerable length of time to the prosecution of his studies. Farming can be taught just as much as medicine, or law, or engineering; but do not let us think that the student of one or other of these subjects can dispense with the subsequent school of experience anymore than he could have done without the previous training of the lecture-room, the hospital, or the workshops.

How then has farming to be taught? First, in the field, under the tuition of a good agriculturist, and where manual work forms a portion of the daily instruction. Every young man intended for a farmer should thus be familiarized with operations, usages, technicalities, the habits of cattle and sheep, the ways of labourers, and the handling of implements. He must not, however, rest here. He is not likely under these circumstances to satisfy his cravings for more knowledge as to the reason of all he sees. He wants a deeper insight, and he will find neither farmer, bailiff, nor labourer, able to supply him with what he longs for. It is at this stage that an Agricultural College becomes essential, an institution where systematic instruction is given upon agriculture, and the sciences associated with it. Chemistry, geology, botany, veterinary, surgery, mathematics, drawing, not only throw a flood of light upon the path of the agricultural student, but raise him to a higher level, and render him an accomplished agriculturist as well as a practical farmer, a man whom landlords will respect, and whom agents will not trample upon one to act as leaven in the agricultural community, and to hasten on a better time. We only wonder that in a great country like this, more attention has not been bestowed upon so direct a method of encouraging agricultural progress.

Our relatives across the Atlantic are more energetic in this particular. We read of a prospective "Agricultural Mining and Mechanical Arts' College" in California, where, in addition to the congressional grant, the Legislature gives the College all interest accruing from the sale of 15,000 acres of land. In Connecticut a large grant is made to further the Sheffield scientific branch of Yale College, where a course of instruction in agriculture occupies the seven winter months. In Delaware, the Legislature passed an Act in 1867 for establishing a "College for Agricultural and Mechanical Arts." "Illinois claims to have been the first to make an effort for the appropriation of national lands to encourage industrial education." As early as 1851 the subject was ventilated, and in 1853 a request was made to Congress, asking for a grant of land, not less in value than 500,000 dollars, "for the endowment of Industrial Universities in each State." Finally, a College was established in Champagne County, with an agricultural department, and experimental and model farms, gardens, and ornamental ground, to the extent of 1,000 acres. Such facts indicate the value attached to systematic instruction in agriculture in the United States of America, a country were the population is no greater than our own, and where the immense area prevents, to a great extent, that competition in land which we see at home. If they value a course of instruction in agricultural science, should we not look upon it as positively essential. We conclude that great benefit will follow a period of study at our own English Agricultural College, and that subsequent residence with a first-rate agriculturist, or better still, with a gentleman who combines practical farming with the work of a large estate, will complete the best possible training for a man who is intended to take a good position in the agricultural world.

AGRI-HORTICULTURAL SOCIETY, CALCUTTA.

PRESERVATION OF CEREALS IN UPPER INDIA.

The paper last submitted was an interesting communication from Mr. W. R. Halsey, Secretary of the Public Gardens at Campooli, respecting certain kinds of cereals raised in that garden, and [illegible] he sends specimens, and requests a report thereon. The following are Mr. Halsey's remarks and report of the Society's Grain Committee:—

"I was very much struck by Mr. Robertson's account of his experiment with selected seed in the Boolundshuhur district, published by the Society in the middle of May 1870, and consequently applied to him for a sample to try in our farm here. He was good enough to send me a seer, but owing to its having been badly harvested, a great deal of the seed had lost its germinating powers, and I had repeatedly to resow the patch of ground I selected for it. The land was average domut, and well manured, and the only difference in the cultivating I made was to put the seeds in one foot apart instead of two. After repeated resowing I got the crop pretty even, and after it was once up, it grew luxuriantly with a very coarse large-leaved straw, very dark in colour. It was very late in ripening, and was considerably injured by what is called "girolie" here, and in England rust. As the area however was only 484 square yards, the out-turn was too small to give any reliable result per acre. The average number of ears from a single grain was 90, with an average of 62 grains to the ear. To an inexperienced eye it looked a very fine class of wheat, and being inexperienced in the classes of India wheat, I showed it to some of the grain-dealers in the bazaar; as in duty bound they all said it was very fine, and on asking them if they knew where it came from, they immediately said the Deccan. I then asked them why they did not import it, and they all said no one would buy it, it made such very dirty-coloured flour; one man informed me that he got up some lakhs of maunds of it for the Commissariat after the mutiny, but was objected to, and had it not been for the scarcity in those days, he would have been unable to part with it. I afterwards took it to the Government miller, Mr. Eastaway, who informed me it was of no use whatever to him, he could not make flour out of it, that it would do to make soojee of, but from its shape and the long hollow indentation in it, the stones would not be able to take the husk off, and that every English miller would condemn it.

"I think, therefore, it would be advisable to place the sample No. 2 I have sent down before the millers and grain-dealers in Calcutta, for their opinion, before any further encouragement is given to the cultivation of it.

"As an experiment I also tried the effect on some white wheat purchased in the bazaar for the purpose, and cultivated under exactly the same circumstances both as to soil, area, irrigation, &c. The result was—each grain produced the high average of 90 ears, each ear averaging 42 grains; but unfortunately the grain was sacrificed to the quantity of straw, and was so wretchedly poor, that my superintendent, in my absence, fed the fowls with it, and I am unable to send you a sample of it. I am satisfied to conduct such an experiment as this; some artificial manure would be necessary, the characteristic of which would be to increase the weight of the grain. There was also another drawback to both experiments; they took a good month longer to come to maturity than the country wheat under ordinary circumstances, and this necessitated frequent extra waterings which, as pointed out by Mr. Bridgeman, is a fatal drawback necessitating as it does additional expense.

"As my attention has been drawn to the subject of the weight and out-turn of wheat and barley crops in this country, it may not be out of place if I give you the information I have gathered on the subject.

"For this purpose I have put up six bags of grain numbered and labelled in accordance with the accompanying table, and I shall feel obliged if you will take every opportunity to test the figures contained therein. Should they, as I believe, turn out correct, I shall have established the fact that weight for weight, Indian wheat and barley are as good as English grain, and that our deficiency is only in the out-turn; *ergo*: if we only had the manure they have in England, we should have nothing to learn from that country in the matter of growing wheat and barley. Oats I have always found light in comparison with English seed, but I apprehend there is no such difference in this staple, but could be remedied by manure.

"It will be understood that my average weights and average yields are distinctly averages, that there are both higher weights and higher yields as there are lower weights and lower yields, and in inviting criticism on this table, I wish my critics to thoroughly understand this, and not to argue on exceptional circumstances.—

Sample.	Description of Grain.	Where grown.	Weight per Imperial Bushel.	Weight per Bushel.	Average weight per Bushel in Bengal.	Average yield in Cawnpore district per acre, Brownson obtained.	Average yield in Bundelcund per acre.	Remarks.
			lbs. ozs.	lbs. ozs.	lbs. ozs.	Bushels.	Bushels.	
1	Red Wheat	Bundlecund Purchased in the Bazaar.	4 0	64 0	62 0	22	22	N. B.—Sample 1, 2 were discoloured, owing to the heavy rains this year, when the grain was still on the threshing floor.
2	Red Wheat	Model Farm, Cawnpore Seed from Mr. Robertson.	4 10	62 0	62 0	22	22	
3	White Wheat	Cawnpore Purchased in the Bazaar.	4 12	62 0	62 0	22	22	Wheat at 16 mds. per acre.
4	Barley	Ditto	4 5	62 0	62 0	22	22	
5	Barley	Allahabad From English Seed received.	4 3	62 0	62 0	22	22	Barley at 13 mds. per acre.
6	Barley	Cawnpore From English Seed.	4 4	62 0	62 0	22	22	
7	Oats	Cawnpore From English Seed.	4 32	66 0	66 0	22	22	Oats at 20 mds.
8	Oats	Ditto	4 11½	67 0	67 0	22	22	
9	Oats	Cawnpore From seed obtained some years ago from Patna.	4 7	66 0	66 0	22	22	

Report of the Grain Committee on certain samples of cereals submitted by W. H. Halsey, Esq., Secretary, Public Gardens, Cawnpore.

Read Mr. Halsey's letter descriptive of the above samples, and after inspection thereof, we beg to report as follows :—

WHEAT.

No. 1. Is good floury wheat, but not suitable for soojee.

No. 2. Flinty, worse than Gungajelly, no use for flour. Soojee might be made from it, but the loaf would not be good, will not do for mixing; a very undesirable description.

No. 3. Good dooda, readily saleable and the most serviceable for flour and soojee.

BARLEY.

No. 4. Country; nice grain, colour fair.

No. 5. Grain good; not so heavy, colour of flour much whiter.

No. 6. A very fine barley.

OATS.

No. 7. From English seed, best.

No. 8 From Cawnpore seed, ordinary sample.

No. 9. Ditto. from Patna, better than No. 8.

Resolved,—That the thanks of the Committee be tendered to Mr. Dunnan, of the Phœnix Mills, for meeting the Committee, and for the assistance rendered by him.—*Agri-Horticultural Society's Proceedings.*

COMPTON'S PATENT CHEMICAL MANURE.

THE Secretary laid on the table several communications respecting this manure. The Government of India placed at the disposal of the Society at the close of 1869, a small quantity thereof which had been distributed to various applicants, but more especially to Managers of Tea Gardens in Assam and Cachar. The results have, in most instances, proved of a negative character. The only really satisfactory return is that of Mr. G. C. D. Betts, of Aurungabad Factory (Moorshedabad District), as detailed in the following letter, dated November 1870:—

"I am in receipt of your favour of yesterday, and I have pleasure in reporting the results on the small quantity of 'Compton's Patent Chemical manure' you sent me up. I applied it as directed on 5 cottahs of land, being a portion of 20 cottahs, which I sowed in peddy, and which I had manured with animal manure. The former gave me a produce of [illegible] maunds the biggah (of 14,400 square feet), while the latter yielded about 12 maunds.

"My tenants, who had sown peddy on [illegible] land, were (owing to the bad season) very [illegible] this year. I dont believe that on an average they get [illegible] maunds the biggah. I should observe that my land was [illegible], well ploughed, and twice weeded, whereas my ryots only weeded their lands once. My opinion is that the chemical manure would answer very well for all crops in India, and that it would pay. I should have been glad to have used two tons of it with my winter crops of wheat, barley, and oats if I could have got it."—*Ibid.*

COTTON FROM MUNIPORE.

READ the following letter, dated 29th June, from Major-General W. F. Nuthall, Officiating Political Agent, Munipore, regarding the sample of cotton already noticed :—

"In compliance with your request I now send you by banghy post, a larger sample of the Munipore cotton. It was purchased in the market in this town where cotton is exposed for sale all the year round. Scarcely any piece-goods are imported into the country, owing to the difficulty of obtaining carriage across the hills, and the Munipores therefore manufacture most of the clothing they use in domestic life.

"This specimen was the best that could be obtained, but I am not aware of any varieties, excepting that which naturally results from growth of the same seed in the hills and in the valley, the climate of which is less favourable to it. I paid 2 annas 6 pies for this specimen, which weighs 7 chittacks; the rate per maund therefore would be Rs. 14 annas 4-4-7

"It is principally grown by the tribes around the valley, and the demand is such that many of them, the Cookies especially, are in better circumstances than the people of the plains. This is evident from the liberal prices they pay for articles they require such as gongs, das, &c.

"This cotton, although of so good a quality, receives no cultivation whatever, nor is the land manured, excepting with the ashes of the jungle which grew upon it, fresh land being taken up every year. The seed is sown broad-cast, and one or two weeding is all the attention it afterwards receives.

"The soil on the lower slopes of the hills, east of the valley, is rich black loam, better adapted for cotton than any I have seen in India, and there are hundreds of acres available, and I believe that all difficulties as to carriage might be removed; but at present there are insuperable obstacles to enterprise, not the least of which, is want of intelligence on the part of the Munnipore Government to its own interests and that of its subjects.

"I came here just in time to prepare a field of cotton in my own grounds, on the principle recommended by Mr. Logan, and published in the Government Gazette, and it is coming on very well. The result I will communicate in due time."

Read also the remarks of the members of the Cotton Committee on this sample :—

Mr. M. Henderson.—"This is a remarkably good sample of Indian cotton, free from stains and seed, fair length and strength of staple, and altogether a very desirable description for home consumption. I would value it at about 8½d. per lb. in Liverpool.

"Further particulars from General Nuthall would be desirable, say, the quantity *now* produced, the quantity *that could* be produced, and the nature of the difficulties in the way of increased cultivation and transport."

Mr. J. Thomas.—"This sample for Bengal cotton has a very good staple, about equal to the best Bhomargaur that comes to this market, but is inferior to that produced on the Bombay side, both in length of staple and silkiness.

"The colour is very good, but I think it would be impossible to get cotton in any quantity so *thoroughly clean* as this is. In my opinion it would not bring here more than Rs. 3 over the price of fair Bengal, though it would probably be worth about 8d. per lb. in Liverpool. It would be much limited here (if well cleaned) for the China market."

Mr. T. H. Mosley.—"This sample is somewhat irregular in *length* of staple as was the case with the small sample upon which I reported for General Nuthall in April last, and such irregularity is doubtless a result of the want of care in cultivation to which he refers in his letter. The cotton represented is however a valuable and very useful description for home consumption, and the best specimen of *hill growth* I have ever seen, being soft to the *feel*, of good colour, and fair staple in length and strength of fibre—present value in the Liverpool market would be fully 8 to 8½d. per lb., taking mid Orleans at 9½d. per lb.

"It will be interesting to learn the result of General Nuthall's own experiment in field culture of this cotton, and meanwhile he might be requested to favour the Society with the farther particulars referred to by Mr. Henderson. If quantity is available, I see no reason why a good price should not command the supply in good condition."

The Secretary mentioned he had applied to General Nuthall for the required information.

CARDAMOM CULTIVATION IN TRAVANCORE.

The cultivation of cardamoms in Travancore is generally carried on in the same manner as in other parts, such as Coorg. As in Coorg, the production of the spice in Travancore is greatly dependent on the "processes of nature." The last Administration Report of the Travancore Government furnishes us with an account of the cardamom cultivation in Travancore which is both instructive and interesting, and shows the increase of produce within a short time. There are several thousand acres of land where cardamom is reared and from which the yield annually is great; still, in the past year, nearly 3,000 acres were again opened for cultivation, which in two years more must produce their first crop, and increase the revenue of the Sircar from this source. In the Travancore forests, or those regions generally known as the Cardamom Hills, the cultivation of cardamoms does not seem to be attended with much difficulty, but is thus carried on:—A suitable piece of land, such as presents the growth of wild cardamoms and large trees, is selected by the ryot, and a "blaze is then run on the trees, to mark the boundaries." As the appearance of cardamom plants is dependent on the rains, the best time to commence operations would be in March. In this month "the under jungle and all growth up to 8 to 10 inches in diameter is cut down and a few large trees of soft and rapid growth are felled over at a distance of about 100 feet apart. This is allowed to lie and rot, and in September or October following the young plants begin to show. When the young plants are too crowded, it is usual to thin them out, leaving from four to six feet clear between the clumps. When there are large open spaces, young plants are transplanted to fill them up." It must be observed that this is precisely what is done in the Coorg forests, there being no systematic planting and manuring in the cultivation of cardamoms. But in Travancore the cardamom plants, we find, do not appear till after three or four months after the setting in of the rainy season, although the felling of the trees is generally completed before the end of April. "After the opening of the garden, the Report states, "it is usual to leave it undisturbed for two years, but in the third year a light weeding is done, and the scanty crop picked. In the fourth year, when the rhizomes will have 8 to 10 stems previous to the crop being gathered, a thorough weeding is gone through with hoes and knives." The collection of the crops is generally done in November, previous to which arrangements are made to have the gardens watched, "as neighbours as well as outsiders are ever ready to rob the produce which finds a ready sale in the Madura villages." After arranging these preliminaries, we observe it stated that "early in November, gangs of coolies begin to make their appearance and the weeding is done before the collection of crop. The gardens are told off into ranges to which is attached a camping ground or *lavalum*. These *lavalums* are usually in the neighbourhood of a stream and of rocks which have to answer the purpose of barbecues. Each ryot has his division told off of these rocks, which ownership has been probably handed down for generations, and very tenacious they are of these claims. The cultivators make their advances to coolies all over the Madura district. As soon as the weeding has been done, the gathering begins. The racemes with the fruit on them are pulled off the plants and brought into the *lavalum* in cumblies or sacks. The day after, before the coolies go out to the gardens, the capsules are stripped off the racemes and the quantity picked measured. A cooly will gather about 5 parahs under favourable circumstances. The cardamoms are then spread out on the rocks to dry, and remain exposed to the sun and dew for four days and nights."

The soil of the Cardamom Hills is greatly adapted to the cultivation of cardamoms. We observe that the best soil suitable for the growth of the cardamom plants is "a rich vegetable mould." In such a soil the plants will bear for many years, but in a poor one, we are told, they soon die out, after perhaps yielding five or 6 crops. It is a peculiarity in the growth of cardamoms that the plants require much shade under which they grow "in great luxuriance"; thus, as it is remarked, the cultivation to the spice has one advantage over that of coffee or tea, that is, in its being carried on without loss to the country of its forests. The cardamom thrives best at an elevation of about 3,000 feet above the level of the sea, but it is found at elevations varying from 2,000 to 3,000 feet. Thus, the difference of the respective elevations of the several hills, and consequently the difference of climate shows two varieties of the cardamom in the Travancore forests. These two varieties bear "distinctive difference to each other in seasons of crop, age of bearing, and also in the appearance of the fruit or capsule." The Perrayer appears to divide the sites where each of these varieties appear, the cardamoms on the east of the river being known as the *Magura alum* and on the west as the *Cumee alum*. The *Magura alum* flowers in April and May and the fruit matures in December and January, while the latter flowers in April and the crop ripens in October and November. The yield in the gardens to the east of the Perrayer river is greater than in the Cumee alum forests. For this difference, the respective elevations of the two forests, and the variation in the rainfall, are accountable. East of the Perrayer, the rainfall for the year hardly exceeds 100 inches, and the elevation is somewhat high, but to the west of it, in the Cumee alum district, the rainfall is much heavier, being from 150 to 200 inches in the year, and the elevation is generally lower, and the country more exposed to high monsoon winds.

We do not think that a correct estimate of the cost of the production of cardamoms, and the quantity of yield of a given area of ground, can be arrived at in the present stage of cultivation in Travancore. There is no regular system of growing, and the cost and out-turn not only very great, according to the seasons, but have hitherto afforded no data to capitalists who may wish to invest in cardamom cultivation, owing to the desultory manner in which the gardens have been attended to. The ryots do not care to secure always a good out turn, and "when a bad crop is anticipated, the gardens usually begin to deteriorate, for the owners then look only to the gathering of the crops, and unless compelled, will hardly weed or attend to the cultivation." To capitalists, however, who intend to invest in cardamom cultivation, the fact that from 20,000 to 30,000 acres of forest in Travancore are yet available, must appear inviting; and these acres represent an annual yield of 250 to 300 tons of the spice, which to the producer, according to the present rates paid by the Travancore Sircar, is worth from five to seven lacs of Rupees. Can therefore the truth of the observation that "a cardamom jungle is a mine of wealth to its possessor" be denied?

INDIGO BLIGHT.

To the Editor of the Indian Daily News.

Sir,—If what Dr. William Carey wrote at the time of his prospectus for an Agricultural and Horticultural Society for India was carried out, a great deal of knowledge would be saved, *i. e.*, "a body of men engaged in the same pursuit from a joint stock of their information and experience, and thereby put every individual in possession of the sum-total acquired by them all."

After reading of the opium blight, and seeing no satisfactory conclusion arrived at, I must mention that about seventeen years ago I had my indigo crop similarly attacked by blight, that is to say, we had all at once some days of heavy rains, and for three months a succession of dry weather. A hard crust had formed on the surface of the indigo fields, and the plants were dying away. I at first (the plant being three feet high) thought that it was for want of nourishment, but the spot being near to the bullock-sheds, where I had some 250 head of cattle, of course it was absurd. I took up some of the plants, split them in two, and found from the root right up that a black mark had gone up through the pith of the stem, and as it went up so gradually, the leaves fell off and the stalks withered.

I called a Committee. Many opinions were given. (I had dug deep in places where the blight was, and found it warm where the hand was held, and so formed my own opinion). As the Committee were all natives, their conclusions were that the devil or *bhooth* had got into the plant. I said no! he has got into the earth, and we must have him out with the plough, which, in my mind, was nothing more or less than that some unaccountable deleterious gas had become confined, and could not escape. I ploughed the whole up, pulling up the blighted plants, and sowing more seed. This saved all the good, and seed vegetating, got a good field, to the astonishment of the natives, and did the same to the whole cultivation. From that day I made it a rule not to save the plough. The native plough does not go deep enough. Indigo is more hardy than poppy, the latter requiring cold and dew, but not rain! It is really wonderful that our rulers have not long ago given up the monopoly! and allowed everyone to cultivate by license or certain tax per beegah, tobacco also, instead of that unpopular income tax which is now creating such bad feelings. Perhaps you may recollect that fanatical sect or race, the Alkalies, in the Punjab! They were thorns in old Runjeet Singh's side, but he was a match for them, they had their agents everywhere; he kept their high Priest under surveillance at Lahore, and dealt summarily with all that turned up; there can scarcely be a doubt but they are at the bottom of all the murders now taking place.

I feel astonished that Government high officials should go to Court or elsewhere on duty, without the attendance of orderlies.

The Darjeeling News tells of enormous produce of tea in the Terai from plants planted 4 by 4. I believe that the Terai was virgin soil when planted, and such a soil is expected to maintain plants for seven years without being manured; they will then die away; but we may well fancy at 4 by 4 the roots must grow into each other's branches also, leaving no space for plucking, and we may well imagine how soon the soil will become exhausted, light being known to exercise considerable influence on vegetation.

The analysis of each variety of plant leads to a knowledge of the salts required from the soil, and an analysis of the soil itself permits us to discover what elements are deficient and what manures are required. Upon an exact knowledge of these facts is built up the whole system of rational agriculture.

The exhaustion of soil arises from the absorption of the essential salts by the crops, and not from the disappearance of its humus or carbonaceous matter, as has been supposed until the time of Liebig!

The produce of sugar is falling off much, for the last twenty years for want of exotic rattoons; the planting of the same rattoon in the same land or soil has naturally died away: and the making of *ghoor* in this district gives a profit of 100 per cent. now.

The same may be said of all the seeds in India. The zemindars do not interest themselves in such things. The consequence will be, that India will import, when it could, by proper management, all and every article of consumption!—Yours, &c.

PRO BONO PUBLICO.

Chinsurah, 22nd September 1871.

AGRICULTURAL STOCK—INDIA.

THE CATTLE BREEDING ESTABLISHMENT AT HOONSOOR.

IN the South-West corner of the Mysore Province, about thirty miles from the town of Mysore and as many from the frontier of Coorg, lies the little town of Hoonsoor, which from being the Head Quarters of the Cattle Breeding Establishment, plays no small part towards the general welfare of the country, and as such deserves special notice in our columns. At this point the Lutchmantoerth river, a tributary of the Cavery, which takes its rise in the Brammagherry Hills between Wynaad and Coorg, is crossed by a fine bridge, built it is said some years ago by a Doctor with engineering proclivities. Judging from the capital manner in which the work has stood, we doubt not that Hoonsoor was as fortunate in those days in its Esculapius as in its Engineer, and that he had time enough and to spare to devote himself to the latter duties, which now redound so much to his credit. It is said also that the two fine mansions in the place owe their large and lofty rooms to his having endeavoured, in days when labour was cheap and timber in the neighbouring forests was abundant, to outvie the Commissariat Officer in their construction. His house, once the property of Sir Mark Cubbon, when in charge of the farm, is now tenanted by Captain Rowlandson, and the other more imposing mansion, with its terraces on the banks of the river, is being converted, by that enterprising Planter, Mr. Donald Stewart of Coorg, into a Coffee Cleaning Establishment. Another imposing pile of buildings at Hoonsoor are the former Commissariat Offices, with a tall chimney. They are now occupied partly as a Taluk Cutcherry and partly as a store room for sandal, for which tree the surrounding country is famed. Nor far from the offices are the Cattle Lines, which, under the supervision of Sub-Conductor Timms, are kept in most beautiful order. Here may be seen upwards of 150 pairs of four-year-old bullocks being trained to pull seige guns, and to meet the drafts from the numerous stations in India and Burmah which are garrisoned by Madras troops. Fine strong ropes made from the leaf of the common date palm are used to tether the cattle; and the members of the Sydapett Farm Committee may be surprised to learn that Mr. Robertson made no new discovery in recommending lately the use of soaked instead of boiled gram, as the Government cattle have for many years been fed on nothing else. A number of elephants, many of them eighty years old that have done duty under Runjeet Singh, and a few camels, form portion of the stud. The neighbouring finely wooded pasture-lands and the reeds growing in the large tanks not far off, furnish them with abundant provender; added to which there are several fine paddocks round Hoonsoor, on which hay is cultivated and stacked for forage in the hot weather. Another feature of Hoonsoor, deserving also of mention, is the Tannery, which formerly supplied the Madras Army with all its pouches, buff-belts and stout Ordnance boots; but since Sir Charles Trevelyan came down with the shears, and Government has taken up the idea that it is better to encourage English than local manufacture, its glories are passing away; yet Maistry Shunkrie, the Foreman of the former works, to whom the pits have been made over, still employs a number of hands, and makes up boots mostly for native corps. After seeing the capital riding and stout-walking boots he turns out, at half the English price, one cannot help feeling surprised that his establishment is not better known and not more largely patronized by the planters of Wynaad, Coorg and Wynaad. The bark of a small shrub with a bright yellow flower known as the Tungadee is used for tanning, though quantities of the Brazilian acacia, the bark of which is superior, have been planted round the compounds and paddocks for the purpose.

Ten miles South-West of Hoonsoor in a rich, well-wooded, and well-watered country, is the great kaval (pasture-land) of Honagode: where, though the season has been unusually dry, the grass is a fine rich green sward, such as may be seen in the meadows of Hampshire or under the canals of Holland. Here the herds, from all the kavals in Mysore, assemble for their annual inspection. This is not such a difficult process as may be imagined. There are two enclosures made of wooden palisades closely knitted together with branches, the one in front opening out in the form of the letter V for the admission of the cattle, and connected with the second oval enclosure by a short narrow passage, which admits of only one animal passing at a time. Here the Commissariat Officer is stationed with his Assistant, and as each animal passes, stock is taken, and the young calves are branded with a red-hot iron almost instantaneously on the flank or shoulder with the number of the year. Occasionally the cattle make frantic but futile efforts to break through the barrier, and at other times, getting timid as they approach the enclosure, they make a stampede, and are not brought up till they have raced over five or six miles of country. There is scarcely a prettier sight to be seen than the numerous herds divided into pals according to the age of the calves. The cows are pure white, with narrow foreheads and retreating horns; while many of the bulls are magnificent animals of a dark bluish tinge, standing high above the rest of the herd. Many of the Sairvegars in charge of the several herds are fine bold-looking men. Each come from a particular part of the country. They provide their own drovers, and though the pay is small, they value the post from the perquisites appertaining, and from the position it gives them among their countrymen. It should be stated that Honagode is not the only kaval belonging to H. M.'s Government in Mysore. There are upwards of 300, scattered over all parts of the country, the most important being the Segay Gooda kaval near Hassan, the large Sholikery tank kaval in Shemoga, Hossdroog in Chittuldroog, and Magadee not far from Bangalore. The cattle have therefore the advantage of being shifted from place to place, wherever the best pasturage may be at the particular season of the year, and to this in a great measure is attributable their speed, pluck, and endurance. When Sir William Denison, with the true instincts of an English country gentleman, perceived the value of these kavals, and the possession of such a breed of cattle to the Government, he directed in 1867, the re-organization of the establishment which had been broken up in 1859, by his predecessor, Sir Charles Trevelyan. A number of cattle of inferior breed had got mixed up with the herds which had been brought in by the Sairvegars, and were re-purchased by the Government. Under the excellent management of Major B. Magrath and Captain Rowlandson, a marked improvement in the appearance of the cattle has now taken place; their numbers have increased from 6,000 to 12,000, while nearly all the bad and old cattle have been weeded out and sold. Much discrimination is needed in this respect, as well as in dealing with the natives of the country and the revenue officials, whose interests often clash with those of the department. It is, however, our pleasing duty to state that thanks to the officers, whose names are above recorded, no department in the country is at present more deservedly popular, and no place more worthy of a visit than Hoonsoor. It is not easy to calculate the good done to the country by the establishment. Already it has saved Government many thousands of rupees by providing the Commissariat with bullocks at moderate charges, and shortly it is expected that the sale of surplus cattle will make it entirely self-supporting. The Mysore country also benefits, as the department has engaged to furnish one hundred bulls annually for breeding purposes, and they are now being distributed, at Colonel Meade's direction, to villages throughout the length and breadth of the land. We are indebted to a valued correspondent, and to a small but able pamphlet, drawn up by Captain Rowlandson, on the history of the establishment, for the above reliable information, which we are convinced must prove interesting to a large number of our readers.

AGRICULTURE IN EUROPE.

AGRICULTURAL SCIENCE, CHEMISTRY, AND MANURES.*

(*By Mr. Robert Stevenson.*)

MR. Stevenson (whose paper was headed "The Progress of Agricultural Science, and the benefits of Chemistry in deter-

* Paper read before the Ayrshire Farmers' Club.

mining the nature and commercial value of manures.") said:—

It [illegible] that Agricultural Chemistry [illegible] to take the place as a useful [illegible] in dispel much of the darkness and ignorance of former days, and explain many of the mysteries and wonders of nature, as displayed in the principles and laws of vegetation. The important and elaborate investigations that have been made to ascertain the composition and nutrition of plants, the nature of the atmosphere, and the composition of soils, the attention that has been given to ascertain the nature, composition and value of manures, with the interesting and important papers that have been written, pointing out their mode of action and fertilizing constituents, all tend to what is most desirable—the union of practice with science. It is from the combined results of practical observation and scientific research that just systems of husbandry can be deduced. Farmers ought to know something of Chemistry, and Chemists something of practical agriculture. Sloth and self-conceit are the enemies of progress, and make a man deaf to all instruction. The most hopeful symptom of our times is the restless activity to make progress and increase our boundaries of knowledge. Sir Humphrey Davy has been styled the father of Agricultural Chemistry. His important investigations and interesting lectures in the beginning of the present century opened up the way for other able investigators. Although he divided the vegetable constituents into organic and inorganic matter derived from the air, water, and the soil, he demonstrates that the action of the atmosphere not only promoted those chemical combinations in the soil necessary to vegetation, but also afforded nutriment to the growing plant; yet his views as to the form in which the food was assimilated and prepared, were neither clear nor distinct, owing to the imperfect state of the science and the want of proper experiments. Liebig has the merit of being the first who laid before the public clear and practical views of the laws and principles of vegetation, and the economy of nature. He has laid the world under a deep and lasting obligation for what he has done for agriculture. The novelty of his theories, the boldness of his opinions, and the clearness with which they were put forward, created a sensation among scientific and practical agriculturists. He found that upon all soils, in the most varied climates, plants invariably contain not only organic, but also a certain number of mineral substances, their nature and quality being ascertained by finding the composition of the ashes; that the fertility of the soil depended on the presence and amount of these fixed and mineral substances, and that carbonic acid and ammonia are absorbed from the atmosphere by the leaves in greater quantities than what is contained in the plant. The patenting of a manure under Liebig's name, which proved very unsuccessful, led to erroneous views and mistaken opinion as to his theory. While nitrogenous manures are necessary, he considered an adequate supply of those mineral constituents which the soil could not otherwise obtain, the most essential and important. He held that water was not only a solvent, but a nutritious element indispensable to the whole process of vegetation, as rain dissolves not only a certain portion of these mineral substances, but also supplies carbonaceous matter and ammonia. A shower in warm weather contains more of these than in cold or wet weather, and the first drops contain more than the last. By thunder storms, fogs, and the distillation of dew and rain, considerable quantities of these fertilizing substances are received. Spring and river water contain about four times less ammonia than rain water, from which is derived the fact that the ammonia is detained in the soil, while the pure water runs on and forms the rivers and the springs.

Carbonic Acid and Oxygen.

The fertilizing influence of the atmosphere is mainly due to the carbonic acid and oxygen gas it contains. Carbonic acid is formed by the decomposition and fermentation of decaying vegetables and organic matter, and the respiration of all living creatures and animals which inspire. Oxygen, which penetrates into their lungs, combines with the carbon of their food, forms carbonic acid gas, and is thrown off from their bodies in perspiration and breathing. The air exhaled from their lungs is not wholesome, as it contains from 3 to 5 per cent. of carbonic acid, while from three to ten parts in ten thousand is the average proportion in pure air. Thus every animal during life, every fire, and every substance under decay, poisons the air by sending out portions of this deadly gas. Wind stirs the air, and is therefore beneficial by mixing it; but this is not sufficient for keeping the air pure for animal life. The plant is the great purifier of the air. As fast as animals and other carbonaceous forming agents emit the poison, the whole vegetable world absorbs and decomposes it by means of energies received from the sun. In the dark, plants are mere fillers. Then their power over this gas is gone. From sunrise to its going down they actively perform their task of retaining carbon, of which they form woody fibre, and give back oxygen to the air, so that they both purify and enrich it. The animals form carbonic acid for the use of plants, and plants give out oxygen for the use of animals. In this way are balanced the animal and vegetable kingdoms. Plants do not take in a visible quantity of food into a conspicuous aperature like the mouth of an animal, but by means of innumerable minute apertures in the extremities of the roots, furnished with a substance like a sponge, called spongiolos. Plants have no stomach, but in the soil through which the radicals spread, their food undergoes a preparation analagous to that which the food of animals is subjected to in their stomach. Their leaves are furnished with a porous texture for imbibing, and tubes and cells for assimilating and absorbing the carbon acid gas from the atmosphere. Thus do we see the wise and intimate relation between animals and all living vegetables. As the water is distilled from the ocean, carried by the clouds and again deposited upon the earth as rain and dew, so those substances which all animals and living creatures breathe, are stirred by the wind, carried through the atmosphere, and again deposited upon the earth as nutriment for the growing plant.

Exhaustion of the Soil.

Soils may be considered as consisting of matter in three distinct conditions. The first may be termed the active matter of the soil, existing in a condition capable of being dissolved in water, and available for entering into the circulation of plants: these are the materials which influence the immediate fertility of the soil, and regulate its productive character. The second is called the dormant matter, being insoluble in water, and therefore unfit for immediately entering into the structure of the plant; but when acted upon by the chemical agents of the atmosphere and the soil, gradually changes to a soluble condition, and assumes an active and nutritive character. The third condition is the gritty or stony portion, the type of the original rock from which all soils are produced, being the fractured particles which have withstood the atmospheric agency for a longer period, but which gradually becomes broken up into a smaller and finer state, and changes into the condition and appearance of the dormant matter. In all soils there is a progressive advancement. Should that which is stored up in an insoluble condition be prematurely dissolved by artificial means, and those that are carried off by the plants not be restored, the soil will ultimately become exhausted. Hence the effect of raising crops from nitric acid and sulphate of ammonia alone, is more like living upon capital than interest, their action being more of a solvent and stimulating nature than direct food for the plant. While we pride ourselves on the increased produce we obtain, we are apt to forget that it may be at the cost of a future diminution of the crop. Should these substances be frequently applied without the application of phosphoric acid or farm-yard manure, the land will ultimately become exhausted. The air constantly shifting is always prepared to yield a supply of the fertilizing substances of the atmosphere, so that the exhaustion of a soil is often due to the removal of the fixed and mineral substances which it cannot otherwise obtain. Not that nitrogenous manures are unnecessary: on the contrary, if applied in moderate quantities upon some lands, they are highly beneficial. The present resources of the soil are thus developed, and made available as food and nourishment for the plant, although we do not consider that new sources of food are added to the soil. The power of bones to lighten strong land by their chemical action, and thus render it less adhesive, is small. If put on to a large extent, they would have some effect; but the small quantity usually applied renders this force insignificant. But they increase the productive capabilities of the soil by supplying phosphoric acid to the growing crops. As a general rule, manures containing ammonia are best adapted for soils of a cold and inert nature, bones being most beneficial upon those of a light, dry, and porous nature, which require a much larger application of mineral substances of a more firm and solid kind. The atmosphere penetrates freely through soils of this nature, and soon disintegrates and consumes the active matters contained therein.

Farm-yard and artificial Manures.

Manure is the term used to designate all vegetable and mineral ingredients which, applied to the soil, increase its productive capability, or, when exhausted by cultivation, restore its fertility. Manures act partly as food for plants, and also by their mechanical influence in assisting the operations of tillage on some soils; they frequently exert as favourable an influence as by the actual increase of the nutritive substances. Nature teaches us the course we ought to adopt in supplying us with farm-yard manure, which must ever be the great mainstay of the farmer. The fertilizing constituents are present in dung, in states of combination which are especially favourable, not only to the luxuriant growth of our crops, but also to maintain the future fertility of the soil. It is a universal manure, because it contains all the constituents which our cultivated crops require to bring them to perfection, and is suited for every de-

scription of agricultural produce. All plants require a supply of organic and inorganic elements for promoting vegetation. Ammonia, carbon acid, and nitric acid are volatile, and are found not only in the soil, but are supplied by the atmosphere—being distinguished as the organic element of vegetation. Phosphoric acid, sulphuric acid, potash, soda, lime, magnesia, chlorine, and sillica are all confined in quantity to the soil, being of a fixed or inorganic nature. The discovery by Chemists of the substances necessary to vegetation, led to the application of artificial manures. Their nature, properties, and composition, have naturally received a large amount of attention from scientific and practical agriculturists. It is not necessary that an artificial manure should contain all the constituents of the crop. This is a condition rarely, if ever, fulfilled. Those of soda, sulphuric acid, lime, and chlorine, are least necessary. Potash and magnesia are more important, though not essential. Nitrogen and phosphoric acid are absolutely indispensable. The fertilizing influence of Peruvian guano is generally attributed to the ammonia, but it is equally certain that much of it is also due to the phosphates it contains, being nearly one-fourth part of the whole. A mixture of salts of ammonia and bones, to make the amount of nitrogen and phosphoric acid equal to guano, is not so nutritious nor beneficial. Guano weighs from 68 to 70 lbs. per bushel, and leaves one-third of a white ash when burned; if more than this, adulteration may be suspected. Sulphate of ammonia, when pure, is colourless, dissolves easy, and with very little residue in cold water, and when heated over a lamp entirely volatile, contains about 24½ of ammonia, and from 2 to 4 of impurities. Nitrate of soda contains about 95 per cent. of the salt, and about 5 of impurities. Common salt, when sprinkled upon red hot coals, flies about with a cracking noise, but the salts of nitrate of soda do not so. Crushed bones or bone-dust may be adulterated with earthy mixtures. Their presence may be detected by mixing with water, when the lighter particles may be washed off, leaving the heavier sand and earthy matters at the bottom; or by burning a weighed portion in the air at a red heat; if the ash exceeds half the weight of bones, earthy or other matter has been added. Dissolved bones ought to be sour to the taste, and water mixed with them and allowed to stand should become distinctly sour.

Phosphoric Acid and Superphosphates.

Phosphoric acid is used by agriculturists in two different states of combination. It may be used in the form of the ordinary phosphate of lime, which is insoluble in water, such as exists in bones, coprolites, &c. But there is another condition in which, by the application of an acid, it is brought into a state of division easily dissolved in water, called soluble phosphates. In bones and all other substances, phosphoric acid is in combination with lime, but sulphuric acid, with its superior attraction for lime, withdraws it from the phosphoric acid, and forms with it sulphate of lime or gypsum, and leaves the compound commonly known as bi-phosphate of lime, which contains only a third of the lime existing in bone earth phosphate. Some consider that sulphate of lime, which forms so large a constituent of the analysis of superphosphate, is added by the manufacturers; but his efforts are more to keep it down, as a large proportion of it excites suspicion and distrust on the part of the farmer, it being impossible to produce bi-phosphate of lime without also containing one-and half times as much gypsum. As the raw materials contain also carbonate of lime especially if coprolites, which, by the acid, is converted into sulphate, we often find a much larger amount. A point of great importance is to determine whether the soluble is always the most economical form in which phosphates can be employed. That it is often so cannot be denied.

An immediate profit being important, it can never be advisable to keep artificial manures lying in the soil for a length of time unproductive. But upon lands of a light nature, the insoluble phosphates in a high state of division, such as exists in bone-dust, are highly beneficial. The value of superphosphates depends upon the nature of the substances from which they are derived. Chemists are agreed that soluble phosphates are the same, from whatever source they are produced, although many practical farmers think differently, believing that those made from bones are of a higher commercial value, being more of an animal nature, and therefore existing in a different state of combination,—being smaller, softer, and more porous in their particles, and more fertilizing and sooner available for vegetation than when they are derived from coprolites. Experiments are urgently called for to determine the value of soluble phosphates derived from different sources. By using a large amount of sulphuric acid, a manure made from coprolites may yield a good percentage of soluble phosphates; but the insolubles are of little or no value to the land; owing to their hard and almost impenetrable nature, they require to remain a long time in the soil before they can be rendered soluble and available as food for the plant. All insoluble phosphates in manures derived from this source are of very little advantage to the farmer. Superphosphate should be purchased in the soluble form, and if the nature of the soil requires a part in the insoluble, mix it with bone-dust, which is more easily assimilated and dissolved. Concentrated manures and various mixtures ought not to be encouraged. The sale of manures would be much simplified, if farmers would purchase the several constituents in a separate condition, and mix them together according to the nature of the soil and the crop to which they are applied. Under the present system, much depends upon the intelligence and skill of the manufacturer than the knowledge and experience of the farmer. The more simple the form in which the substances are purchased, the less liability is there to deception. A farmer who has a knowledge of the intrinsic value of manures is enabled to guard himself against imposture by the aid of chemistry, in establishing a method of expressing the value of all the substances of manures, and insisting on the method of selling by analysis, accompanied with a guarantee of the substances they contain. The analysis should also contain the date of manufacture, and the signature of him by whom the analysis is made. But how few take the trouble to satisfy themselves that the manures received contain the substances guaranteed, or are commercially worth the price they were sold for. Makers of chemical manures buy the materials they use by analysis, and why should farmers be less alive to their own interest? The trouble is little, and the expense nothing, compared with the interests at stake. The honest manufacturer will assist and encourage the farmer to secure a genuine manure, because he knows that the result will be to his advantage. The dealer who under-values and considers analysis unnecessary, sells a manure that will not bear investigation.

Value of Manures.

The plan pursued by Chemists in the valuation of manures is simple and easily understood. All substances for the growth of plants have a definite commercial value; the quantity of each ingredient is estimated by its value, and the amount is determined by adding the whole together. No system of valuation can be made perfectly complete; for it is well-known that many samples can be produced at a cheaper rate and analyse well, while others do not analyse so well but show a better result in the field. Bones being rarely used alone, are generally mixed with bone-ash, or if a cheap manure, with coprolites and other substances. The condition of a manure is also of the highest importance. A damp and ill-reduced manure is not so valuable as a carefully manufactured article in which the various constituents are brought into a dry and fine state of division. But Chemists have been able to form a general system which is a sufficient approximation to the relative value of these substances. Agriculture is much indebted to Professor Anderson for his many able reports and investigations, and the clear and comprehensive style of his writings and publications; and to Professor Voelcker and Messrs. Gilbert and Lawes for the many experiments undertaken to ascertain the nature of manures and the laws and sources of vegetation. Experienced Chemists have adopted a nearly uniform method of expressing the analysis—the different constituents being arranged under several great heads. All expressions, such as phosphate and carbonate of lime, sulphate of lime, potash, and soda should be rejected, because in place of giving an estimate of the value of a manure, they are only calculated to mislead and confuse the purchaser. In some analysis the ammonia is not stated separately, but given as sulphate of ammonia. Now ammonia is the substance determined, and there is no reason why it should be calculated into sulphate, which contains only about 24½ per cent. of pure ammonia. Those who are not acquainted with the terms of chemistry are apt to be deceived as to the amount. Some manufacturers seem to consider that Chemist's valuations are too low, and have intimated their intention not to abide by their valuations. We consider that soluable phosphate is too high, especially if derived from coprolites, for which from £24 to £26 is sufficient value, while that of ammonia is too low. Ammonia in sulphate of ammonia, costs nearly £70, but this is the dearest form in which to purchase it. Potash, though valued at £20 per ton, is seldom found in manures in sufficient quantities to exert a beneficial influence, and except in particular cases, it is not customary to take it in. In order to ascertain whether or not a sample is genuine—without determining all the constituents—it is necessary to determine the quantity of soluble and insoluble phosphates and ammonia. The main constituents being right, it may be fairly assumed that the others will not differ materially.

Co-operation.

We think the time has now arrived when meetings should be held and Committees formed to consider the best and most suitable manner of purchasing manures, so as to give encouragement to the honest manufacturer, and to prevent the imposition upon farmers of worthless substances in manures. Some counties have appointed a Chemist, not only to test their manures, but to teach farmers a knowledge of chemistry and scientific cultivation. Others advertise for a large quantity of

manure, offers are received, the manure tested upon delivery, and then it is divided out among the members. In some places a co-operative system of manufacture of manure has been introduced. To secure a large number of members, small shares are allotted, and are taken up both by landlord and tenant, and others interested in agricultural prosperity, and the whole is entrusted to the superintendence and inspection of a large and influential Committee. Co-operation has, of late, been very successful in many branches of business, and we see no reason to doubt its success in the manufacture of manure. The object of modern cultivation being to obtain from a given surface of land, a greater amount of vegetation than that which is produced by nature; requires the farmer to expend large sums for artificial manure, and his interest and success depend on the care and attention exercised in the selection and preparation of substances to impart fertility to the plant. We must be cautious not to overlook the benefit and importance of a superior tillage of the soil, being necessary for the luxuriant growth of the crop; so that not only the fertilizing influences of the atmosphere may be obtained, but that the roots of plants may have a freedom of action for searching after the food they require. The liberal application of manure, and the proper cultivation of the soil, must stand side by side as valuable co-operators in the same service. Husbandry being an operation of boundless variety, extending to many objects in nature, it is exposed to more casualties than any other branch of business, involving care, troubles, and anxieties; and these are neither few nor slight.

What bliss, what wealth did ever the world bestow on man. But cares and fears attended it! No one will insist that agriculture has reached its highest degree of perfection. Everything must be pressed into the service that skill and ingenuity can contrive, to increase the products of the soil, and lessen the cost of production, to meet the growing requirements of increasing trade and accumulating population. The experience and skill acquired by observation, may have been sufficient for the practice of the husbandry of the last century; but the position and practice of modern agriculture demand that the farmer should be more or less acquainted with the principles and progress of the scientific, as well as the practical department of his art. There are some who consider that the progress of agriculture is not in keeping with that of trade and commerce. But, be it remembered, that to increase their production they have only to extend their premises and increase their machinery. We cannot extend the boundaries of our farms without diminishing those of others. It is only by industry and superior cultivation that we hope to arrive at the desired end, as Providence, who rules the temperatures and the seasons, also determines the success or failure of our various operations. We feel assured that agriculture will never be found ploddling on behind, but will always be in keeping with the progress and requirements of the age.

DISCUSSION.

Mr. Lees, Carngillan, said the proposal was well-worth considering, that the Society should arrange with a Chemist to get manures analysed. Farmers were very much imposed upon by manure agents; and it would be a great advantage to them to have a Chemist who would analyze any samples of manure sent to him.

Mr. Bone, East Sanquhar, agreed with Mr. Lee that farmers were much defrauded in this matter. Frequently they were not in a position to get the analysis checked, and therefore they had just to take the manure as it was sent to them. Generally speaking, he would say that bones and guano were the cheapest things to be got in the market. Although the price of guano had been raised, it was still perhaps the cheapest light manure they had. With regard to analysis it was not always to be trusted. He believed they were all pretty-well acquainted with a manure sold here, six or eight years ago, which bore as good an analysis as any in the market. Well, one year particularly, having purchased a good deal of it, he made about thirty experiments, and he was sorry to say the great proportion of them were nearly utter failures. He afterwards ascertained that the manure was made from coprolites, which, he agreed with Mr. Stevenson, were of very little value to the farmer.

Mr. Wallace, Barachead, said it was to their loss that they did not pay more attention to the subject that had been so well brought before them to-night. He thought their only safeguard in buying manures was to deal with respectable parties. He agreed with Mr. Bone, that they could not get on in this district without artificial manures. They would have to adopt a new mode of farming if they did not use them to stimulate their crops. He agreed with what had been said as to the value of bones, but at the same time he was of opinion that bones were not all of the same quality. Old dry bones, in his opinion, could not be of the same value as fresh ones.

Mr. Young, Kilhennie, thought the day was not far distant when portable manures would be bought more by analysis than they had been. He thought it was the best security they could have against imposition. He was satisfied that the greater number of manure merchants were very respectable men, and that if they did sell adulterated manures it was against their knowledge, and because they themselves were deceived. It would be well for them all to lay to heart the remarks made by Mr. Stevenson, about the careless way in which they attended to their farm-yard manure. It would be a good thing if the services of an analytical Chemist for the county could be secured. This had been done in Kirkcubright and other counties, with very satisfactory results.

Mr. Caldwell, Knockshoggle, said, if he was not mistaken, the Agricultural Association had a few years ago engaged a Chemist (Mr. Smith) to make analysis of manures.

The Chairman said that was quite true, and he was very little employed.

Mr. Caldwell said he agreed with the speakers who had said that the artificial manures chiefly to be depended on were guano and bones. Instead of buying the compounds which were offered for sale, he preferred to buy the substances by themselves, and then mix them to please himself according to the soil and crop. He remembered, two or three years ago, preparing a manure with bones and a little potash for potatoes. The mixture cost him upwards of £9 a ton. He was induced at the same time to buy 1 ton of potatoe manure, which he was told was far better than anything he could mix. The price of it was £10 a ton, but to oblige him it was reduced to the price of his own mixture. Well, the potatoes grown with that manure were worth from £2 to £3 an acre less than those grown with his own mixture.

The Chairman (Mr. R. M. Cunninghame) said it was their duty, as agriculturists, to do what they could to ascertain the kinds of manures which were best suited to the district in which they resided. He would agree very much with some of the speakers in saying that they should keep to guano and bones. He was now much averse to prepared manures. He thought the farmer should prepare them himself. There might be something in what the manufacturer said, that he could mix the different ingredients better than they could, but it was so vital to them to have a good crop, that they should take the trouble of getting the substances separately, and mix them themselves. Mr. Stevenson had wisely recommended that they, as a club, should join together to secure genuine manures. One way might be to engage some respectable firm to furnish manures containing certain ingredients, or they might join together to import the raw material and get it prepared for themselves. He believed in this way they would have it much cheaper; and there was another advantage they would gain. When he used a large quantity of prepared manure, from a feeling of doubt he had about it, he had often applied double the quantity that was requisite to secure a good crop. Now if they got a substitute that they could rely on, they could apply it with more confidence, and this waste would be prevented. He agreed with what Mr. Stevenson said about their waste of farm yard manure. He thought their landlords ought to do something in assisting them to provide covered courts and dungsteads. He believed it would be for their interest to do so, as it would enable farmers to put more and better manure on the land, and without this, land would come to be of less value than at present.

A vote of thanks having been tendered to the Chairman for presiding, the meeting separated.

ADULTERATION OF MANURES AND FEEDING STUFFS.

THE Royal Agricultural Society of England is doing good work in publishing the names of the firms who by cheating the farmers also cheat the country, as the application of the expensive trash deteriorates rather than fructifies the land, and prevents the husbandman from obtaining the yield he otherwise would. The Report of the Society's Consulting Chemist, though long, we give in extenso, as it refers to one of the most important matters in connexion with agriculture at the present day.

The following is the report :—

1. Last March I reported the following analysis of an artificial manure, which was sent to me by Mr. Catchpool Feering Bury, Kelvedon, Essex :—

Moisture	9·65
*Organic matter	17·54
Phosphate of lime	4·99
Carbonate and sulphate of lime	48·77
Alkaline salts and magnesia (chiefly common salt)	3·22
Insoluble siliceous matter sand	19·83
	100·00

* Containing nitrogen	1·12
Equal to ammonia	1·36

In comparison with the price at which Peruvian guano is sold, this manure would be dear at £2 a ton.

Mr. Catchpool has since informed me that he bought this artificial manure from Messrs. H. Marshall & Co., Quay, Wivenhoe, Essex, as fish and bone manure, at £5-5s. per ton, and sent me the accompanying letter and copies of analysis, which he received from Messrs. H. Marshall & Co.

Quay Wivenhoe, February 27th, 1870.

EDWARD CATCHPOOL, *Feering Bury.*

DEAR SIR,—In accordance with your request enclosed, you have copies of analysis of our fish and bone manure.

We are exceedingly busy with it, and sending out from 20 to 30 tons per day. Sir John Tyrrell, of Bircham House, had 1 ton of our fish and bone manure, and tested it for barley and oats in a forcing house; and Mr. Lewin, his land steward, stated in Chelmsford market, on Friday, that the fish and bone manure beat all the others, and the only thing near it was Peruvian guano.

Your order shall have our best attention.

Yours faithfully,
(Signed) H. MARSHALL & Co.

COPY.

Result of analysis of fish and bone manure by Professor Voelcker, Analytical Professor to the Royal Agricultural Society :—

LABORATORY, 11, SALISBURY SQUARE, FLEET-STREET,
London, October 21, 1870.

Moisture	14·74
* Organic matter and salts of ammonia	21·29
Phosphates of lime and magnesia	10·07
Sulphates and carbonates of lime	35·29
Alkaline salts	10·64
Insoluble matters	7·97
	100·00
* Containing nitrogen	3·62
Equal to ammonia	4·39

Fee received, £5-5s.

(Signed) A. VOELCKER.

COPY.

Result of analysis of soluble fish and bone manure by Professor Sibson, F.C.S., Professor of Chemistry in the Royal Agricultural College :—

LABORATORY, 11, EATON TERRACE, ST. JOHN'S WOOD,
October 20, 1871.

Moisture	1·13
* Nitrogenized organic matter and salts of ammonia	22·58
Precipitated phosphates	14·02
Insoluble phosphates	7·03
Sulphate of lime	27·63
Alkaline salts and magnesia	6·44
Insoluble siliceous matters	7·17
	100·00
* Containing nitrogen	3·00
Equal to ammonia	4·70

(Signed) ALFRED SIBSON, F.C.S.

FEERING BURY, KELVEDON, *March 16th* 1871.

MY DEAR SIR,—Thank you for your letter received this morning, also for the trouble you have taken. The same post also brought a letter from Marshall & Co., in which they write: "There is no necessity for you to correspond with Dr. Voelcker, as we are in communication with him." Is this statement correct? as I do not gather from your letter that you have heard from them. I shall be glad to hear.

Believe me to remain,
Yours faithfully,
(Signed) EDWARD CATCHPOOL.

DR. AUGUSTUS VOELCKER.

A sample of boiled bones sent by Mr. Barbour, of Bolesworth Castle, Chester, on analysis, was found to have the following composition:—

Moisture	5·76
* Organic matter	11·64
Phosphate of lime	40·47
Carbonate of lime, magnesia, and alkaline salts	12·53
Insoluble siliceous matter (sand)	29·60
	100·00
* Containing nitrogen	·94
Equal to ammonia	1·14

This sample it will be seen was largely adulterated with sand. I have not been able to learn whether it was sold as pure boiled bone dust, and at what price per ton.

3. In another sample, sold as pure and unadulterated bone dust, to Mr. Henry Straker, Riding Mill on Tyne, I found 28·66 per cent. of sand. This sample was taken out of the middle of one bag. Having reported the bone dust to be adulterated, Mr. H. Straker sent me a fresh sample taken from several bags, and then mixed before taking the sample, and requested me to make a full quantitative analysis, which yielded the following results :—

Bone dust sent by Mr. H. Straker, Riding Mill on Tyne, March 8th,—

Moisture	7·30
* Organic matter	18·17
Phosphate	41·46
Carbonate of lime	13·36
Alkaline salts and magnesia	3·22
Sand	16·09
	100·00
* Containing nitrogen	2·67
Equal to ammonia	3·09

Like the preceding sample, it was not pure and genuine bone dust, although it was bought at £8, 7*s.* 6*d.* a ton, as will be seen by the invoice of Messrs. Oliver and Snowden, seed and cake merchants, and dealers in Peruvian Government guano, nitrate of soda, tar, grease, and oils.

H. STRAKER, ESQ,
Riding Mill, Haltwistle.

Bought of Oliver and Snowden, Seed and Cake Merchants, &c.

Feb. 25, 1871.—67 bag of bone dust, 5 cwt. 2 qrs., at £8 7*s.* 7*d.*	£ 42	14	2
67 bags	1	19	1
£	44	13	4

Stocksfield.—Carriage not paid.

Mr. Straker sent me a copy of a letter in which occurs the following passage :—

You will probably remember also having had a sample of bone dust which I had bought as "pure and unadulterated," and which, on getting your analysis, I sent back. I heard in the train to-day that it was afterwards sent to a neighbour of mine (he told it to me himself), who also had it analysed, not liking the look of it, and the report was worse than yours; he too refused it, and they actually sent him a copy of your analysis to me, which I had given them in justification of my refusing it,—this they sent to my friend, to show how wrong his Chemist was. They offered to deduct 10*s.* a ton if he would keep it.

4. German potash salts: Kinite.—Mr. H. Straker also sent me a sample of kinite, which he had bought from Messrs. Keighley and Maxstead, of Hull, on a guarantee that the kinite should not contain less than 23 per cent. of sulphate of potash. I find, however, only 18 per cent. of sulphate of potash in the sample sent to me by Mr. Straker, on February 23rd 1871.

The sample was taken from a burst bag, and as it might not have fairly represented the percentage of potash in the whole delivery, Mr. Straker sent me another sample, which was a mixture taken from the middle of ten bags. The second sample of kinite, received March 8, yielded :—

Potash	10·35
Equal to sulphate of potash	19·15

Both the bone dust and the kinite were returned by Mr. Straker, as not being according to the guarantee.

5. British economical manure.

A sample of so-called artificial manure was sent to me by Mr. W. Levett, Glassenbury, Cranbrook, who informed me that the manure is called the British economical manure; that it is manufactured by Mr. B. Coveny, 17, Devonshire Square, Bishopgate street, London, and sold at £12 per ton. Its composition was as follows :—

Moisture	12·20
* Organic matter and water of combination	8·07
Sulphate of iron	14·09
of lime	15·78
Alkaline salts (sulphate of soda chiefly)	44·01
Sand	5·85
	100·00
* Containing nitrogen	·23
Equal to ammonia	·28

This economical compound contains a mere trace of ammonia, no phosphates whatever, and is a worthless mixture of green vitriol, crude sulphate of soda (salt cake), gypsum, and sand. It has already been mentioned in the quarterly reports, and its utter worthlessness pointed out to farmers. Mr. Levett states that he bought 1 ton, and some of his neighbours more than this quantity.

6. I would also direct attention to the composition of a

sample of British guano, sent for examination by Mr. Joseph Mastin, Bengeworth, Evesham :—

Moisture	19·26
* Organic matter	26·61
Phosphate of lime	13·43
Sulphate of lime	11·63
Magnesia and alkalies	10·74
Sand	18·94
	100·00
* Containing nitrogen	1·59
Equal to ammonia	1·93

This British guano contained not quite 2 per cent. of ammonia and 13 per cent. of phosphates, and on the other hand a good deal of sand and gypsum. It is scarcely worth £4 a ton.

I have received no particulars of the price at which this manure was supplied, or the parties from whom it was received.

There have been several cases of inferior guano, and also, I regret to say, some that have been also adulterated.

7. Adulterated guano—A sample of Peruvian guano, sent by Mr. W. Lamin, Brestwood Park, Nottingham, was found to contain, in 100 parts :—

Moisture	15·22
Carbonate and sulphate of lime	5·54
* Organic matter and ammonia salts	35·43
Phosphates	16·63
Alkaline salts, &c.	6·94
Sand	20·35
	100·00
* Containing nitrogen	5·79
Equal to ammonia	7·02

It will be seen that this guano was adulterated with a large proportion of sand and earthy matters, which yielded only 7 per cent. of ammonia. It was sold at £12-10-8 per ton.

Bestwood Park, May 1, 1871.

DEAR SIR,—You wished me to inform you how I bought the guano I sent you for analysis. I enclose you the invoice. Mr. Wood, a friend of mine, assures me that he only gets 5s. per ton for selling it, calls it Peruvian guano, and he believed it to be good. He bought it from W. Shaw & Co., 15, Tithe Barn Street, Liverpool.—Yours faithfully,

W. LAMIN.

DR. AUGUSTUS VOELCKER.

P.S.—Mr. Wood did not sell the guano as best Peruvian, but said it was cheap at the price he sold it.

W. LAMIN.

A case of adulterated guano, supplied by the same firm at Liverpool, was mentioned in the last quarterly report.

8. Another sample of adulterated guano was sent for analysis by Mr. N. Basket, Braines Hall, Wetheringsell, Stonham, Suffolk, who paid for it £12-15s. cash. It had the following composition :—

Moisture	17·74
* Organic matter and ammonia salts	21·97
Phosphates	2·07
Carbonate and sulphate of lime	12·02
Alkaline salts, &c.	5·35
Sand	12·75
	100·00
* Containing nitrogen	4·01
Equal to ammonia	5·00

9. Fish and bone manure.—One of the most worthless artificial manures examined by me during the last quarter, was a sample of so-called fish and bone manure, sold at £5 per ton, delivered free, sent by Mr. N. Basket.

This compound, as will be seen from the subjoined analysis, yielded only one-third of a per cent. of ammonia (in round numbers), and only 3½ per cent. of phosphate of lime, and the remainder was not worth the carriage to any distance. Such a manure would scarcely be worth 10s. a ton, delivered free of cost on the farm.

Composition of a sample of fish and bone manure sent by Mr. Nathaniel Basket, Braines Hall, Wetheringsell, Stonham, Suffolk :—

Moisture	11·06
* Organic matter	[illegible]
Phosphate of lime	3·45
Sulphate and carbonate of lime	51·[illegible]
Magnesia and alkaline salts	[illegible]
Insoluble siliceous matter (sand)	[illegible]
	[illegible]
* Containing nitrogen	·31
Equal to ammonia	·37[illegible]

* The Professor has not received the names of the vendors of these manures, but has applied for them.

7 OCT.

10. Concentrated fish manure.—A manure received from W. W. Gascoyne, the Lawn, Sittingbourne, was offered to him as concentrated fish manure, at £4-10s. per ton, but according to the subjoined analysis, it was worth only £2 per ton.

Composition of a manure sent by Mr. W. W. Gascoyne, the Lawn, Sittingbourne, called concentrated fish manure, April 21, 1871 :—

Moisture	17·[illegible]
* Organic matter	21·37
Biphosphate (equal to bone earth 2·[illegible])	1·21
Insoluble phosphate	5·[illegible]
Sulphate of lime	20·64
Alkalies	1·14
Sand	32·14
	100·00
* Containing nitrogen	·[illegible]
Equal to ammonia	·[illegible]

Mr. GASCOYNE writes :—

The Lawn, Sittingbourne, May 9, 1871.

DEAR SIR,—The manure merchants are much dissatisfied with the result of your report, and will seek an analysis on their own account. The price they ask me for this manure is £4-10s. per ton; they say it consists exclusively of acid, fish, and scutch: they cannot understand the 32·14 "insoluble siliceous matter," and 20·64 "sulphate of lime," but these must come with the scutch from the tanpits.—Yours faithfully,

(Signed) W. W. GASCOYNE.

The names of the dealers have not been furnished.

11. Another very inferior manure was received from Mr. Edward Wadham, Millwood, Dalton-in-Furness. This manure had the following composition :—

Moisture	26·74
* Organic matter	20·[illegible]
Phosphate of lime	5·30
Oxide of iron and alumina	4·40
Carbonate and sulphate of lime	4·63
† Alkalies and magnesia	11·53
Sand	17·05
	100·00
* Containing nitrogen	1·37
Equal to ammonia	1·66
† Containing nitrate of soda	·72

I estimated its value at about £2-5s. a ton. In reply to my enquiries, Mr. E. WADHAM, writes as follows :—

Millwood, Dalton-in-Furness, May 15th 1871.

SIR,—Absence from home must be my apology for not having sooner attended to your favour of the 6th instant. Your analysis entirely confirms my suspicions. The article was purchased from one William Gradwell, of Barrow-in-Furness, and he charged £8 10s. per ton for it. I shall, of course, only pay him according to your valuation, and if he makes any difficulty about it, he must stand the consequences.—Yours obliged,

(Signed) EDWARD WADHAM.

DR. AUGUSTUS VOELCKER.

12. Composition of a sample of patent blood manure sent by Mr. J. Minett :—

Moisture	10·24
Water of combination and * organic matter	15·01
Biphosphate of lime (monobasic phosphate of lime)	11·10
Equal to the bone-phosphate (tribasic phosphate of lime) rendered soluble by acid	17·40
Insoluble phosphates	8·14
Sulphate of lime	40·54
Alkaline salts and magnesia	2·01
Insoluble siliceous matter	3·27
	100·00
* Containing nitrogen	1·62
Equal to ammonia	2·21

Stoneley Hall, Arley, near Coventry, April 11, 1871.

DEAR SIR,—I have sent you a sample of patent blood manure by rail to analyse as No. 5, and enclose you a post office order for £1.

The price of the manure at my station is £10 per ton; it is bought from a very respectable firm, and I should like to know whether I have value for my money.—Waiting your analysis, I remain, yours truly,

JUNIUS MINETT.

A. VOELCKER, ESQ.

Stoneley Hall, Arley, Coventry, May 26th 1871.

DEAR SIR,—On the receipt of your analysis, I forwarded a copy of it and your letter to the firm the manure was purchased from, and enclose a copy of their reply, which I do not consider at all satisfactory. They enclose a receipt for £2, the difference of their No. 2 and No. 3 manures. If I had not had an analysis,

I should not have known their mistake (as they put it). I have not given the name of the firm, but will do so if you require it.

I am, dear Sir, yours truly,
JUNIUS MINETT.

DR. VOELCKER.

P.S.—On looking at the bags, I find they are marked No. 3. They have three prices for their patent blood manure: No. 1, £6; No. 2, £8; No. 3, £10; No. 3, I ordered.

J. M.

May 17*th* 1871.

COPY OF REPLY.

DEAR SIR,—Immediately upon receipt of your sample, we tested it, and find that it is No. 2 blood manure, and not 3. We exceedingly regret that such a mistake should be made, and for the future we shall brand the bags with red instead of black, so that no such mistake can occur. With forwarding towards 200 tons daily, a mistake such as this cannot be wondered at with workmen, as the only distinction on the bags is the letter 2 and 3. The price Dr. Voelcker puts upon it is simply absurd. The ammonia is 20*s.* per cwt.; the soluble phosphate, 6*s.* per cwt., which shows at once:—

17·40 Soluble, at 6*s.*	£ 5	4	0
2·21 Ammonia, at 20*s.*	„ 2	1	0
Insoluble, all from Peru guano, 8·14 at 2*s.* 6*d.*	„ 1	0	0
Organic matter and sulphate lime	„ 1	10	0
£	9	18	0

The standard for price is Nesbit's, and the price of ammonia is the market price.

We guarantee the No. 3, 20 per cent. soluble phosphate, 4 per cent. ammonia, that is 2 per cent. more than the No. 2.

We are, dear Sir, yours truly.

The Committee have requested Professor Voelcker to write at once for the name of the firm who supplied this manure.

13. Adulterated rice meal. In the next place I have to report a case of adulterated rice meal, sent to me for examination by Mr. W. Stubbs, Bickerscote, near Stafford. This meal had the following composition:—

Composition of Adulterated Rice Meal.

Moisture	8·36
Oil	1·72
Protein compounds	7·87
Starch, sugar, &c.	43·75
Woody fibre	11·14
Mineral matter	24·16
	100·00
* Containing nitrogen	1·26

Analysis of Ash

Phosphate of lime	3·44
Magnesia and alkalies	2·80
Sulphate of lime	11·73
Silica and sand	6·19
	24·16

It will be noticed that this meal was mixed with gypsum; and as it contained 24 per cent. of mineral matter and 11 per cent. of indigestible woody fibre, it is no wonder it did not agree with Mr. Stubbs's stock. In answer to my inquiries respecting the name of the vendor of the meal, price, &c., I received the following note:—

Dunston Farm, Penkridge, March 25*th* 1871.

SIR,—Mr. W. Stubbs, of Bickerscote, has laid before me your analysis of a sample of rice meal, from a lot purchased by him, also your letter requesting him to give the name and address of the vendor, and as he had some doubts as to how far this would render him liable in case it was published, I have prevailed on him to place in my hands the invoice and correspondence relating to it, to forward to you if I thought fit. I do so because I believe it is the only way to check the shameful impostures to which we are every day made victims. Mr. Stubbs wishes you to send the paper back to him at once, as he consumed 7 sacks of it before he had any suspicion of its contents, and which he has not yet paid for.—I am, yours truly,

(Signed) FREDERICK BYRD.

DR. AUGUSTUS VOELCKER.

(Copy of Invoice.)

Corn Exchange, Oldwinsford, Stourbridge, Charles Harrison.

TERMS CASH.

December 31, 1870—23 sacks No. 1 Rice meal, 14*s.*	£ 18	2	6
26 bags not returned, 1*s.* each	„ 1	5	0
£	19	7	6

MR. W. STUBBS

14. Linseed cake, containing castor-oil beans.

The following letter was received from Professor Varnell:—

Beech House, Belton, Suffolk, April 23, 1871.

MY DEAR DOCTOR,—I send you two pieces of cake taken from a parcel I am feeding some bullocks with. It has made them ill, and I will thank you to examine it and inform me what it contains that is injurious to health. Some part of the lot has been damaged, I suppose, from having been heated in bulk, and I observe that a fine crop of fungi has sprung up on the surface of some of them, which I have thought may have something to do with the illness of the beasts, but of this I am not certain. It may contain in its composition, seeds and other matter which have done the mischief, but of this you will no doubt be able to inform me. It is possible that you may have had samples to analyse from the same lot of cake, as other farmers beside myself have had reason to complain.

A reply as early as convenient will oblige.

Yours truly,
(Signed) GEORGE VARNELL,
Member of the Royal Agricultural Society.

DR. A. VOELCKER.

Beech House, Belton, Yarmouth, April 29, 1871.

DEAR MR. VOELCKER,—I beg to thank you very much for your kind letter respecting the cake. With regard to the conditions under which it was bought and sold I am quite ignorant. All I know about it is, that a merchant in Yarmouth imported cargo of the cake, and sold it to some farmers, who very soon, I believe, complained that it made their bullocks ill. The merchant requested me to try some of this cake with some of my cattle. I therefore had a sack of it taken to my farm, and on the following day I gave three bullocks about 4lbs. each of it, which they readily ate, and on the following day they were all decidedly ill. The symptoms were indicative of considerable irritation of the mucous membrane of the stomach and intestines. They refused all kinds of food for nearly two days afterwards. As the symptoms in each animal were precisely the same, I did not think it necessary to test the cake any further, being satisfied in my own mind that it was unfit for food for cattle. I daresay, I shall be able to find out whether it was sold as pure linseed, and also at what price.

Beech House, Belton, Great Yarmouth, May 25, 1871.

MY DEAR SIR,—About the end of this week a gentleman will send to you, by my advice, three samples of cake for you to analyse. They are from the bulk of some cake I sent you small portions of a short time since; but he, Mr. Watting, an extensive merchant, fancies the said cake, *i.e.*, the bulk is composed of two or more kinds, which he would be glad to ascertain. He has lately been feeding two or three lots of sheep upon this cake, and has not detected that it injures them in anyway.

I remember that in your very kind letter to me, you asked "who was the seller of the abovementioned cake, and the price it was sold at?" I have learned that the price was £10 per ton, but finding it produced disease in many cattle that were fed with it, he sold the rest of it by auction.—Believe me, yours truly,

GEORGE VARNELL.

DR. A. VOELCKER.

A careful microscopic examination shewed not merely the presence of fungi, but also that of the husks of castor-oil beans. The cake, I need hardly say, is totally unfit for feeding purposes.

I have reason to believe that the same cake has done much mischief in Suffolk and Norfolk, inasmuch as I had samples of cake very similar to that sent by Professor Varnell sent to me for examination by non-members of the Society, who complained of the mischief done by the cake to their stock.

15. Another cake was sent to me by a gentleman residing in Essex, not a member of the Society, sold at £11 10*s.* as of best English linseed, which was composed chiefly of the screenings from pure seed, and which had caused considerable loss amongst sheep. This gentleman, not being a member of the Society, the names of the parties concerned cannot be given.

16. The next case on which I have to report is that of a sample of linseed cake, which was sold at £12-5*s.* to Mr. E. H. Davies, Palton, Wenlock, Shropshire, as best cake.

Its composition was as follows:—

Moisture	11·34
Oil	11·00
* Protein compounds	29·25
Gum, mucilage, starch, &c.	37·15
Woody fibre	9·52
† Mineral matters	7·96
	100·00
* Containing nitrogen	4·68
† Containing sand	1·40

Although this cake was not a bad feeding cake, it was nevertheless adulterated with pollard or similar starchy Mill refuse materials, and certainly not best linseed cake, nor worth £12-5s. a ton.

Mr. Davies writes to me as follows :—

Patton, Wenlock, April 18th 1871.

DEAR SIR,—The linseed cake which I sent to you for analysis, and which I have received, was bought from Mr. Barnet, of Brosseley (agent). It is a cake made at Hull, but the maker's name I do not know. It was sold as a genuine linseed cake, and is stamped (best). I have had three different lots from the same maker—one lot stamped (pure), the other (genuine), and this which I sent you (best). It cost me £12-5s. per ton. I have fancied it was a good cake, my cattle eating it well; but a neighbour of mine having bought some from the same person, with which he was not satisfied, I thought I would have it analysed to satisfy myself if there was anything in it except linseed. Although you state that the cake in question is adulterated with bran, &c., still the composition is very similar, at all events compares favourably with that of a cake sold by Mr. Firmstone, Stourbridge, and which you state is a pure linseed cake of first-rate quality. To explain what I mean, I enclose your analysis of the two cakes, which, if it is not giving you too much trouble, I shall be glad to have returned.—Yours faithfully,

(Signed) EVAN H. DAVIES.

17.—Another sample sold as best English linseed cake was found adulterated with nut cake, and made from dirty linseed. It contained in 100 parts :—

Moisture	11·93
Oil	10·60
* Protein compounds	27·06
Gum, mucilage, &c.	29·29
Fibre (woody)	15·60
* Mineral matters	5·56
	100·00
* Containing nitrogen	4·33
* Containing sand	·98

Mr. Leggat of Bromwich, Titchfield, Hants, says in his letter to me :—"I have reason to believe the cake contains some ingredient highly injurious to stock, as I have during the last five weeks lost thirty lambs which have been fed on it.

(Signed) AUGUSTUS VOELCKER, F.R.S.

The report was adopted.

TOBACCO.

TOBACCO CULTIVATION AT DHARWAR.

READ the following letter from Mr. E. P. Robertson, Collector of Dharwar, in reference to the Tobacco Committee's report, submitted at the May Meeting, on his samples of tobacco:—

"I have to thank you for the printed papers containing the report on the tobacco sent by me.

"It appears to me that there must be some mistake as to the tobacco containing little or no nicotine. Very many of my friends have tried the tobacco and pronounce it to be good with, however, the fault of being exceedingly strong. Now the strength of tobacco comes from its nicotine, and if the specimens I sent contain no nicotine, whence the strength?

"I believe that nothing destroys tobacco so much as moistening it. How then is acetic acid and chloride of sodium to be used in the curing?

"If the process of desiccation had been carried on too quickly, the tobacco would have been of either a green or greenish yellow colour. If too slow it would have been black, like much of the country tobacco.

"Referring to the report on tobacco by Dr. Forbes Watson, and his extracts from the treatise by Mr. Mandis, I perceive that the amount of nicotine, in a great measure, depends on the extent to which the leaf is allowed to ripen. The riper the leaf, the more the nicotine. The amount of nicotine does not appear to depend on the curing.

"The soil the tobacco was grown in is a hardish red moorum soil, containing much iron, probably that may account for the colouring matter being so much developed.

"The tobacco of which the cigars were made was *precisely* the same as the leaf sent. It was submitted to *no process whatever* by the manufacturer beyond the simple process of rolling it up into cigars. It was taken from the same heap as the leaf specimen sent, and was made up at once before me in my verandah.

"I intend to have some of each description of the tobacco leaf analyzed, and also intend to submit the soil in which it was grown to the same process.

"I have had some of the cigars packed up for some months to test how far they are proof against insects. None have been attacked by insects. Some Manilla cigars, some Trichinopoly cheroots, and some of 'Cope's cigarots,' all packed up at the same time have, however, been entirely destroyed by insects. As regards liability to attack of insects, the experiment has been quite in favour of the tobacco cured by me.

"I make these few remarks as I am anxious that we may at length arrive at the proper method of curing tobacco in this country. Thanking the Society for the kind trouble taken regarding the specimens sent by me."

TOBACCO CULTIVATION, BEING A BRIEF ABSTRACT OF DR. FORBES WATSON'S REPORT ON TOBACCO.

"The introduction of a system of cultivation and preparation of tobacco possessing first-rate qualities, requires so much care that it can only be successfully attempted by means of Experimental Farms."—DR. FORBES WATSON.

(*Supposing the area of ground on which the experiment is about to be tried to be an acre.*)

The seed-bed.

Enclose with a wall (brick) about one foot and a half high, a space five feet broad by twenty-five feet long. Dig out the soil, enclose to a depth of two feet, replacing the soil removed by two feet of strong stable manure. When this begins to ferment (to steam) cover with six inches of prepared earth and sow the seeds.

Sowing the seed.

To sow the seed more carefully, mix it with white-wood-ash, and scatter the whole equally over the surface of the prepared ground (the seed ought to fall about four to the square inch, but with so small a grain as tobacco it is impossible to be exact) and cover with an inch of good mould.

After-care for the seed.

After sowing, water the seed-bed with a fine-rosed watering pot. The sowing bed should be provided with a reed-mat covering, which after watering should be stretched across from wall to wall. This covering should be taken off (to allow the steam from the manure to escape and to admit fresh air) for two hours every morning and every evening.

Three days after the first sowing, the bed should be watered again. (N. B.—Water early in the morning.)

Pricking out.

In about a week the plants should appear, and when they seem to crowd, should be pricked out, leaving distances of one inch each way round each plant, thus :—

. . . . . .
. . . . . .
. . . . . .

(N. B.—The spare plants should be preserved for filling up gaps in the rows when transplanted).

Planting out.

When the plants have developed four or five leaves, any one of which is an inch broad, may be transplanted. The seed bed should be watered in order to make the pulling up of the plants easier, and when pulled up the plants should be removed as quickly as possible to the site prepared for them.

The tobacco field.

This site (supposed to be an acre in extent) should be level ground and exposed; a fence should be round it to protect it from jackals, &c. The soil should have been ploughed deep twice before the plants were put in and afterwards harrowed and rolled carefully.

The soil.

It should have a fine light soil with a firm loamy subsoil, manured with strong ammoniac manure, at a ton per acre, with a free distribution of vegetable remains.

Tobacco an alternate crop.

The site of the tobacco plantation should be changed every two years, as tobacco is a most exhaustive crop.

(*N. B.*—Sun-flower would alternate with it well.)

The plant of the field.

The plants should be planted in rows two feet apart, each plant two feet from the next, a pathway being left for the coolies between (not every row but) every two rows. A broader pathway (five or six feet broad) should intersect the plantation at right angles, forming at the point of intersection, a convenient space for heaping the leaves.

Watering.

When the plants have been set out, water well. (N. B.—The watering pots used should have very finely perforated roses and

if any plants die, fill up the gaps with spare plants from the seed-bed.

Hoeing.

After a day or two, hoeing should commence. The hand is the best instrument, and the workmen should be told to kill every insect they see except ants, and to heap the earth carefully round the stems.

Pruning.

If the plant threatens to be very leafy, remove superfluous leaves, leaving about fifteen to a plant. When the flower buds are plainly noticeable, they must be picked off with great care. (N. B.—For fancy smoking tobaccos, the flowers need not be removed.)

After-care of the plants.

There is after this very little necessary. The plants, however, should be most carefully examined once or twice a week, and every insect and weed removed. Water should be supplied freely at intervals of a week, and to prevent the earth losing its humidity too suddenly, straw might be spread over it if the heat of the sun is peculiarly great.

Picking the leaves.

The leaves are of three qualities :—the lower, middle, and upper, and the first to ripen are the lower. (To "ripen" is really to assume a yellow tint and bend down towards the ground.) As soon as yellow leaves begin to appear among the lower leaves, they must be picked. In about eight days the middle yield will show signs of ripeness, and should be gathered, and in about eight days more the remainder may be gathered. It can, however, be easily known that the leaves are ripe when they detach from the leaf-stalk with ease. They should be detached with the hand, the leaf being pulled upward.

Care must be taken to have labour available to gather each harvest in at its own time, for over-ripeness is fatal to proper curing.

Curing the leaves.

The only thing to be remembered in curing tobacco is that care must be taken not to allow the tobacco to lose its moisture too suddenly, for thereby it becomes brittle—or too slowly—for then it is in danger of rotting. The rules on this head which hold good in Europe are however useless in India. The curing-houses again may be of any shape, provided only that ventilation is thorough, and that sunlight and damp are equally avoided.

When the leaves have been picked, they are placed in heaps (which must be turned at intervals) to wilt, that is to fade and wither. By being in a heap, they keep their moisture, and though quite dead, do not lose their flexibility.

The leaves are then strung (on string or sticks) in the curing house; after this they are exposed to the sun: they are then tied in bundles and heaped to induce fermentation. The details of the curing processes cannot be learnt from works on European tobacco cultivation, but may be acquired easily by the study of the *temperature* of this country, during every hour of the day, and every day of the year, and by a clear knowledge of what is required to be produced. Again, the arrangement of the leaves in the curing-houses so as to economize space, utilize ventilation, &c., &c., gives scope for the ingenuity of each cultivator, and cannot be learnt by rules.

One point however to remember is that the leaves must not stick together when strung.

Sorting the leaves.

When the leaves are dry without being brittle, dead and discoloured, but still pliant, they are said to be cured and are ready for sorting

The importance of choice of manuring and watering.

The sorting of the leaves depends of course upon the local market for which the tobacco has been raised, but a safe rule is to keep for cigars all that can be kept for cigars, and to use the remainder for tobacco. Snuff, which requires the finest leaves of all, would not in India repay the manufacture. For natives of this country, the tobacco must be strong; for the European market, it must be aromatic; for any market, it must burn easily. It is evident, therefore, that very much depends upon the manure used, as the matters drawn from the ground must materially determine the strength and combustibility of the produce. A heavy soil, strong manure, and plenty of moisture, produce a strong and rank tobacco: by ripening also tobacco gains in nicotine. Sunshine, dry warmth, and a light soil give on the other hand mild and aromatic tobaccos. It is from this evident that next to the manure employed, the most important point is the quantity of the moisture, and if the manufacture is for the native market, this should be liberal.

The midrib: how to dispose of it.

The great difficulty in curing tobacco is the disposal of the midrib which persists in either drying stiff or not drying at all. But why should it not be removed? Not entirely, for then the leaf would be split into two, but only on the back of the leaf, where the convex and greater part of the midrib projects. The operation, though a delicate one, would become easy to any child after a half-hour's practice. The operator would take a leaf in the left hand, holding it between his finger and thumb at the stalk end. About half an inch from the end (the stalk end), he would make an incision in the midrib with the thumb nail of the right hand and turn up an end. He would then take hold of this with the finger and thumb of the right hand, and with an equable force pull off the midrib downwards towards the point of the leaf. As soon as it became very fine and there was a danger of the leaf being torn, he would nip the midrib off with his finger and thumb. By this the concave or nearly flat surface of the midrib would be left on the upper side of the leaf, while on the back of the leaf the only sign of the midrib would be a narrow *depression* running down the centre of the leaf where the troublesome midrib *had* been. The operators (who might easily be children) should be particularly warned *not to handle the leaf or to make a rent in it.*

The great care necessary not to handle the leaves.

Indeed, throughout all the operations of picking out, planting, hoeing, thinning, sorting, stringing, and midrib-scooping, every operator should be warned against touching the leaf, except near the stalk end and against tearing it. Care might be guaranteed by grading the wages of the operators according to results.

The sun-flower.

The sun-flower (*helianthus*) might be advantageously grown among the tobacco: *1st*, for the shade it would give to the larger and coarser tobaccos required; *2nd*, for the admirable stringing rods (if string itself is not used) which their stems supply; *3rd*, as they would (if their leaves were ploughed into the ground) give almost the exact vegetable mould which is required by tobacco.

The Foresters' Gazette.

BOMBAY, 21st October 1871.

Dr. KING'S REPORT ON RANIKHET.

Ranikhet has had a narrow escape from the fate of Almorah. The lapse of two years more would, in all probability, have left the former as dry and barren as the latter. The soil consists of disintegrated micaceous rock, often naked and exposed, but at the bottoms of the valleys coated over with from ten to fifteen feet of fine brown loam, derived from decayed and decaying vegetable matter. With such a porous substructure it can expect to enjoy good drainage, but at the expense of a not over-abundant supply of water and scant vegetation. The only forest trees found are the rhododendron, oak, and *cheer*. These two last are striving for sole possession; and Dr. King, who has been giving the matter his full attention has pronounced, that unless some check is placed on the latter, the beggarly *cheer* will soon jostle out his more imposing neighbour. This would be in every way undesirable, as the *cheer* gives next to no shade, and its leaves do not improve the surface soil in the same way as those of the oak do. If the oak were to be driven from the post it now holds, the water-supply, temperature, and beauty of Ranikhet would all be sufferers. But the existence of both *cheer* and oak has been threatened by the wasteful attacks of the residents and neighbouring villagers. The latter especially have no conscience in the matter, cut down far more than they can ever use, and leave the surplus to rot. Even where forest laws have been enforced, they have been known to ask for forty trees to build one of their miserable little huts; and from this fact may be inferred their reckless waste when unfettered. Ranikhet has now been taken by the Forest Department under its protection, and extensive nursery grounds are being planted out. Dr. King has suggested the following trees for timber:—the deodar, toon, kakar, walnut, larches, Scotch fir, ash, beech, elm, oak, and Spanish chestnut, together with several varieties of the eucalyptus and casuarina; while for fuel he recommends the oak, rhododendron, utus, wild cherry, poplar, and the Australian acacias. These last two have been planted with great success on the Neilgherries; they spread by suckers, and once established, can hardly be eradicated. Till these nurseries, however, have become accomplished facts, and even for some time longer, the denizens of Ranikhet will be badly off for building and fuel timber, as they are to get nothing but what the Forest

Department reports, unless they care to go a long distance for it. We commend to all lovers of the gentle craft of forestry, Dr. King's report. It is a most interesting and exhaustive one, for which many a future inhabitant of Ranikhet will have cause to thank him.

TRANSMISSION FROM ENGLAND TO INDIA OF TIMBER TREES AND FLOWERING SHRUBS, HERMETICALLY SEALED, BY PATTERN POST.

Extract, paragraph 14, of a letter from the Superintendent of the Botanical Gardens, North-Western Provinces; to the Secretary to the Government of the North-Western Provinces, No. 392, dated the 20th April 1871.

Para 14.—Timber trees and flowering shrubs, by Dr. Forbes Watson. These in cases filled with timber trees and flowering shrubs and hermetically sealed, were forwarded from the India Office per pattern post. Many of the plants were in excellent order, and are now in a most thriving condition. This mode of transmitting plants is highly novel, and well worthy of being tried on an extensive scale with the finer kinds of flowering shrubs. But the cases ought to be forwarded from England in December, January, and not later, and the stems of the young plants ought not to be less than two-eighths of an inch in diameter. Leaden numbers ought to be attached to the plants to correspond with the numbers on the invoices. In the cases there were parchment labels, but most of them were destroyed by the moisture and heat.

The President read the following acknowledgment of the above communication :—

1. I have the honour to acknowledge receipt of your endorsement, No 2562, dated 12th instant.

2. I am desired to express the satisfaction of the Society that this first attempt of Dr. Forbes Watson in the transmission of timber trees and flowering shrubs, in hermetically sealed tin cases, per pattern post, has been attended with so much success.

3. Whilst recognising the great practical utility of Dr. Watson's novel mode of transporting trees, shrubs, &c., I am desired by the Society to point out that however great may be the facilities offered to Government Officers, such as Dr. Watson, for sending such cases by pattern post, the public are precluded from adopting it, as the Post Office authorities will not receive such packets or cases hermetically sealed or otherwise closely secured for transmission by pattern post. Until therefore some relaxation is made under this head,—there is a practical restriction on the adoption of this means of transport.

4. The Society would therefore suggest the propriety of having this restriction relaxed, first in favour of public bodies like the Agricultural and Horticultural Societies of England, India, and the Colonies.

5. The Society would be glad to be furnished with a list of the trees and shrubs sent by Dr. Forbes Watson, noting those that perished, as also to be informed whether the trees and shrubs were rooted plants or cuttings, and how they were packed, whether with moss or mould round their roots, or the roots left simply bare.

6. If the process of hermetically sealing the cases had the effect of rotting parchment, the same excessive moisture and heat will destroy soft-wooded plants, as it does, in a short space of time, cuttings even after they have been hardened, however carefully packed.

FRUITING OF THE MALE PAPAYA TREE.

SUBMITTED the following letter from Mr. F. E. G. Matthews, of Nynee-Tal, on the above subject.—"Perhaps it may interest you to know that a male tree of Carica Papaya has at Kaludoongee, at the foot of the hills, produced some three or four fruits. Instead of being produced, as in the case of the female tree, on a short footstalk and close to trunk, they are developed at the extremities of the long branching stalks, common to male trees when in flower. I examined a number of fallen flowers, but could perceive no change in their structure, apparently they possessed stamens only. I perceive that most works on Botany speak of the Papaya as plants bearing unisexual flowers, i.e., staminal flowers and flowers with pistils on separate trees. The so-called female plant of Papaya appears to me to be a perfect flower, having both stamens and pistils, and the flowers do not grow in racemes as in the male plant. Whether the fruits on the male plant will ripen, or whether they will produce seed, I am not able to say. I will have them watched. But perhaps the phenomenon of fruit on male trees is familiar to you.

Remarks by Mr. John Scott:—"In the normal condition of the Papaya the flowers are unisexual and diœcious (the male flowers being on one plant, the females on another) though not unfrequently we find male individuals in which many of the central flowers in every cluster are either *truly hermaphrodite* (with stamens and pistil) *or female*, and then in all respects similar to those on the *female plant*. Now in the normal male flowers, the corolla is tubular, and bears ten slightly-exerted perigynous stamens, five alternate with the petals and longer than those opposite to them. In the hermaphrodite flowers the corolla has five distinct petals similar to those of normal female flowers, stamens five hypogynous (or inserted around the base of the ovary) and alternate with the petals, thus indicating strong systematic relations with plants, widely separated from it under the present classificatory arrangement. The fruit of these hermaphrodite flowers are usually about one-third less than those on female plants, in all other respects the same; the flowers are also prefectly self-fertile, as I have ascertained by artificial fertilization with own-pollen. Amongst the seedlings thus raised there is further a great predominance of male plants, and nearly all bearing a considerable number of hermaphrodite flowers. In some of the seedlings of the second generation, there is also a very marked reduction in the length of the panicle; thus as I have stated above, the panicles vary in length on the normal male plant, from 2, 4½ feet long; whereas in those bearing the hermaphrodite flowers, I frequently find them only 6 or 12 inches in length . . . . I shall follow up my experiments with those plants, fertilising individual flowers with own-pollen and sowing the seed of those generation after generation, with the view of establishing a truly hermaphroditic race: such as, we may theoretically assume, an early progenitor of the Papaw has been. This seems to me supported by the fact that though we do find occasionally hermaphrodite flowers on the female plants, we never do find normal male flowers; and thus as it appears to me does the occurrence of hermaphrodite flowers on the male panicles, (which with the superaddition of stamens are identical with the normal female flowers) indicate the more lately acquired character of the structure of the male flowers, and their extreme modification as compared with those of an hermaphrodite structure, goes far to explain the more permanent character of the morphologically less modified female flowers."

SARSAPARILLA.

PROPOSAL TO IMPORT ROOTS OF TRUE SARSAPARILLA.

READ a letter from Lieutenant J. F. Pogson, suggesting that the Society import roots of the true Sarsaparilla. The following is an extract of the letter:—

"Would you be so good as to bring to the notice of the Council of the Agricultural and Horticultural Society, that in consequence of the very high price of true Sarsaparilla, an inferior substitute is used in the hospitals. The chemists charge six rupees for a pint of 'Sarsaparilla,' which is as bad as 16 rupees for a lb. of extract of Taraxacum.

"It is admitted that Sarsaparilla is a blood purifier, and as it is of great value, the Society would confer a boon on India, if arrangements were made for obtaining either the seeds or suckers of the red Jamaica Sarsaparilla (*Smilax Sarsaparilla*) for cultivation in this country.

"There is a shrub in the plains, which bears an edible fruit, the size of a pea, and deep puce colour. It is called Meakoo by the natives, and 'Sarsaparilla' in Shakespear's Dictionary.

"The *Salsa* is also put down as Hindee for Sarsaparilla, of which the Arabic name is '*Ushba*.'

"In addition to these names, the hospital substitute is called '*Un-unnut-tomool*,' which may be another name for Sarsaparilla. But it is clear the genuine plant does not belong to India, though I dare say it would answer very well. If obtained from Jamaica, information as to soil and locality should be given, *i.e.*, whether it grows in the 'Blue mountains,' or in their valleys and plains. This is another plant, which our tea and coffee planters should take in hand."

The Secretary mentioned that Mr Scott had kindly responded to his request in reference to Mr Pogson's suggestion, by sending a memorandum on the medicinal Sarsaparillas, which he now begged to submit. While thanking Mr. Pogson for his communication, the Council were not, all circumstance considered, disposed to recommend the Society moving in the matter. The following is Mr. Scott's memorandum :—

"The *Smilax Sarsaparilla* was introduced to the Botanic Gardens here by Dr. Wallich in 1838, and in 1840 he says of it that 'although a native of the southern parts of the United States of America, the plant does not as yet grow very freely with us.' It struggled on, I believe, for a few more years under pot culture in the conservatory, and ultimately died. It was subsequently introduced by Dr. T. Anderson with the same results, so that there is evidently little hope for its successful culture in the plains of India. This is the less to be regretted, however, as notwithstanding the name of the plant, it does not yield any of the Sarsaparilla of commerce, and there is no evidence that it ever did yield any. Dr. Wood remarks that its roots would certainly have been dug up and brought into the market, had it been found to possess the same properties with the imported medicine—*Pereira*, while discarding this specimen, however, as

the drug yielder, I may state that there is yet considerable uncertainty as to the Botanical origin of the several kinds of this drug met with in commerce. Pereira states that *S. officinalis, H. Bk., S. Medica, Schlechtendal, and S. papyracea, Poiret*, are probably the species from which the greater part, if not all the Sarsaparilla, of commerce is obtained. The red Jamaica Sarsaparilla, which is the best and most valuable kind in the market, is suspected by Pereira to be the produce of *S. officinalis*. It is a native of New Granada, and chiefly found on the banks of the Magdalena near Bajorque. It is the Zarzaparilla of the natives of these regions by whom according to Humboldt and Bonpland, large quantities are sent to Carthagenia and Mompox; whence it is shipped for Jamaica and Cadiz. It is largely exported from that Island to England, whence the name of Jamaica Sarsaparilla, for it was not then known to be indigenous in Jamaica. Simmonds, however, states that in 1853, some thousands of pounds of Sarsaparilla were brought to Falmouth and Jamaica last year, and bought by merchants for export. It came from the province of St. Elizabeth, and there are whole forests covered with this *weed*, for such in reality it is. It is too the *real* black Jamaica Sarsaparilla that is much valued in the European and American markets. It is also found in other parts of the Island. *S. papyracea* is found in the province of Rio Negro, in marshy forest tracts on the banks of the Japura near Porto dos Miranhos and various other moist forest regions in tropical America. Neither of the above species have as yet been introduced to our gardens here, though I do not doubt that they might be successfully cultivated in the moistier of the tropical valleys of the Himalayas, though I do not think other culture in the plains of Bengal would be at all likely to prove a commercial success. The third species *S. medica* is found on the eastern slopes of the Mexican Andes, and according to Schiede is the only one of the numerous species found thereon which is collected in the villages of Papantla, Tuspan, Nantla, Misantla, &c., and carried to Vera Cruz, under the name of Zarzaparilla, whence it is sent into the European market as *Vera Cruz Sarsa*. This species naturally affecting moist and shady, though well drained localities (somewhat similar to those of that other valuable drug yielding root Ipecacuanha) might doubtless also be afforded suitable sites on the moistier of the forest clad flanks of the tropical Himalayas. The roots of the different species might be easily imported in quantity by mail steamer in closed boxes from Jamaica to England, thence to India *via* the Suez Canal. Thus sent, the roots should arrive in good order if taken up while dormant (or at least when vitality is lowest, for I believe the above named species are ever-greens in their indigenous *habitats*), exposed in an airy verandah until free of any extraneous moisture, and then placed in layers alternating with others of a stiff and dry soil.

"Roxburgh has the following remarks on the medicinal virtues of the two following Indian species:—*Smilax glabra* is a native of Silhet and of the adjacent Garrow country, where it is called Harina or Harina-shook-China. Its root is large and tuberous, and not to be distinguished by the eye from the medicinal drug brought from China, under the name of China root. The natives of the above countries prepare a decoction of the fresh root annually for the cure of sores and venereal complaints. *S. lanceifolia* is called Gootea-shook-China by the natives of Eastern Bengal where the plant is indigenous, and its large tuberous roots are much used by them in medicine. They are so like those of *Smilax China* as not to be distinguishable by the eye. By the natives the juice of the fresh root is taken inwardly for the cure of rheumatic pains, and the refuse, after extracting the juice, laid over the most affected parts. Both species, I hear, have been introduced from time to time into the Botanic Gardens here, though with no great success, and they seem to have been lost many years ago. The roots of the *Smilax ovalifolia*, the Koomurki of the Bengalees have also had medicinal qualities ascribed them, but this is apparently a mistake, as I cannot hear of their being thus used in India as stated in the Treasury of Botany.

"*Smilax China* is as its specific name implies, a native of China, and a somewhat prickly undershrub of from two to three feet in height, though attaining a greater size, and a scrambling habit when growing in thickets. The rhizoma of this forms one of the *China roots* of the shops; it is recommended as a substitute for Sarsaparilla. The Chinese eat it under the idea that it invigorates them.—*Lindley*. Baboo K. L. Dey of the Calcutta Medical College, remarks in his indigenous drugs of India, that the root is largely used by native physicians, under the name of *Chob Chinee*. It resembles Sarsaparilla in its medicinal properties, and can be given with advantage for the same purposes for which the other (called here *Salsa* or *Shorsh*) is prescribed. The market rates are about one rupee four annas per lb. I cannot hear that this species has as yet been tried in the Botanic Gardens here

"I find from some of the old garden records that Dr. Willich cultivated somewhat extensively in the Botanic Gardens here the Indian Sarsa—*Hemidesmus indicus*—the *Unnontmool* of the Hindoos. He thus writes of it:—This country fortunately affords an excellent equivalent for Sarsa in the *Unnontmool*, which besides possessing while fresh a very grateful smell, has all the virtues of the genuine drug, and may be procured, with a little exertion, at a far lower rate than the imported precarious and expensive American Sarsa, that is, at about *four annas* per seer. By desire of the Medical Board I have furnished he dispensary with 18½ maunds of the recent root at the above rate since April last, and I hope soon to supply a further quantity. The shrub is of a nature that requires much space and shade to yield a plentiful return of root; I have, notwithstanding, taken steps to cultivate it so as in time to furnish a large quantity without any extra cost. On the medical qualities of this part, Pereira remarks that it has been employed as a cheap and efficacious substitute for Sarsaparilla in cachetic diseases; but both its effects and uses require a more extended examination than has yet been devoted to them. Dr. Ashburner says that it increases the appetite, acts as a diuretic, and improves the general health, 'plumpness, clearness, and strength, succeeding to emaciation, muddiness, and debility.' It has been used with benefit in venereal diseases. In some cases it has appeared to succeed where the Sarsaparilla had failed and *vice versa*, it has frequently failed where Sarsaparilla succeeds.—*Materia Medica*

"Dr. O'Shaughnessy considered the activity of this medicine to be much more decided than that of Sarsaparilla. In the Calcutta bazaar the dried roots are sold at about 12 annas per seer, and this though exactly treble that at which Wallich supplied them to the dispensary, would not, as a cultural product, realize the ground-rent to the culturist.

"I don't know what plant may be referred to by Mr. Pogson as producing the edible fruit, &c., and called *Muloe* by the natives."

Letters were read:—

From the Secretary, Government of Bengal, and the Superintendent of Studs, North-West Provinces, applying for information in connection with Colonel Boddam's memorandum, regarding the "Sargo" plant.

"The Secretary mentioned he had, in reply, referred to the communications the Society had sent to the Government of Bengal, as introduced in the proceedings of the last (July) meeting.

From Colonel Horace Brown, Deputy Commissioner, Thayetmyo, British Burmah. "I have introduced,"—writes Colonel Brown,—"silkworm breeding into the Jail here; I shall therefore be able to send you a supply of eggs whenever you like. But it will be better to wait until the cold weather I think. I should be much obliged if you would put me in communication with some one who would send me down one of the simplest silk-reeling apparatus used by the natives in Bengal. What is used here is rude in the extreme, and the Bengal one would probably be an improvement upon it.

From H. Leeds, Esq., Conservator of Forests, Bengal, applying for information regarding the silk yielders of Assam, and mode of cultivation, &c. (Complied with.)

From Messrs. Law, Somner & Co., Melbourne, advising the despatch per *James Service* of the annual supply of field seed. (Received and in course of distribution).

GIRDLED TREES BEARING FRUIT.

(*From the Canada Farmer.*)

OUR readers have heard of the atrocity of girdling some 1,500 fruit trees near St. Joseph, Michigan, last spring, and how the neighbourhood turned out in a body and bandaged them up so as to save them. It will also be recollected that a second but lesser raid was met in a similar manner. And now for the sequel. It will be interesting and gratifying to our readers to learn that every one of these trees are living, and that Mr. Green, the owner, has realized an immense crop of fruit from them the past season. This fact is considered quite marvellous by the residents round about. Those wise in such matters explain it by saying that the interception of sap by girdling has caused the production of fruit instead of wood this season, and that the real trial for the life of the trees will come next year. It used to be thought that there was no help for a girdled tree, but that theory is now exploded. In the above case the damage was remedied by bandaging the trees with strips of cloth dipped in wax. If the girdling was very broad, we apprehend that a large portion of those trees have borne fruit for the last time. A better way of saving girdled trees, we apprehend, is the following, which has been very successfully practised for some twenty years in Nashua, New Hampshire,—Mr. Lemuel Town, we believe, was the first to act upon, and suggest to others the idea. His method is to graft five or six scions as large and round as a goose quill, and long enough to reach over the girdled place into the tree. The live bark is first notched above and below the girdle, the sprouts sprung into place, and the ends sealed with wax. These scions grow rapidly, and in time spread over the whole girdled surface. Apple trees completely girdled, and having the bark taken off over a foot in width on one side, have been saved in the above manner by Mr. Town.

Official Gazette.

BOMBAY, 21st October 1871.

EXPERIMENTAL FARM—MADRAS.

ANNUAL REPORT OF THE MANAGEMENT OF THE GOVERNMENT FARM MADRAS, FOR THE YEAR ENDING 31ST MARCH 1871.

(Continued from our last.)

Egyptian Maize.

A supply of maize was obtained from Egypt. The sample was much inferior to the varieties we have introduced from Australia; indeed it was no better than the indigenous maize of India.

Maize.

A further supply of maize was obtained from Sydney; but the quality was not so good as that obtained last season.

The varieties obtained were the Richmond river, the Mackey, and the Hogan.

The following table shows the percentage of vital seeds each sample contained :—

	Per Cent.
Richmond River	85
Mackey	83
Hogan	77

A sample of Queensland—one hundred and twenty days variety—which was saved from last year's crop for seed, contained 98 per cent. of vital grain. The cobs, since harvest, have been suspended over ropes in the granary. The seed was in a very fine state of preservation; it had received little or no damage from insects. Another sample of this maize, which had been shelled shortly after harvest, and had been stored in the usual manner, was so much injured by weevils as to be almost worthless as seed.

With the exception of the few acres sown in alternate rows with cotton, the crop was cultivated precisely in the same manner as last season.

As in last report, I gave very minute details regarding our cultivation of this crop and the results attending its cultivation, it seems unnecessary to go over the same ground again.

Twenty-five pounds of the Richmond river variety was sown on the 5th October. The crop was reaped on the 29th of December, when it yielded 1,112 pounds of cobs and 2,225 pounds of straw. The weather being so excessively dry during the four weeks previous to harvest, the plants ripened prematurely, and the yield was thereby lessened greatly. The cobs are small, and the straw short; this variety is evidently one of the dwarf varieties of maize.

Twenty pounds of Hogan maize was sown on the 13th of October, and was reaped on the 21st of January. The yield was only 507 pounds of cobs. This is a small-sized variety, and as it does not possess any merit that the Queensland and Mackey do not also possess, does not appear to deserve much attention.

Twenty-five pounds of Mackey maize was sown on the 17th of September. It was harvested on the 27th of January, and yielded 2,702 pounds of cobs. This is a large variety of maize. The cobs are larger than those of any variety we have yet introduced. The grain is also large, but is flat and square-shaped. The straw was bulky, and the crop stood nine or ten feet high. This is a good variety, and is well-worth general cultivation.

Several experiments were made with different manurial top-dressings on the maize crop, amongst others the following :—When the maize was six or eight inches above the ground, ten plots of equal size were manured with different manures, at a cost in each instance of 16 rupees per acre. The results are as follows :—

Manure.		Yield per Acre.			
		Gross Yield.		Increase due to Manure.	
		Cobs. lbs.	Straw. lbs.	Cobs. lbs.	Straw. lbs.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In some of these instances was the cost of the manure wasted; this is entirely to be attributed to the dry weather experienced. During the seven weeks previous to harvest we only had two showers of rain, while the total fall only amounted to one inch.

I have found that top-dressings, unless the weather is showery, produce little or no effect on our short-lived crops. Though we had in the experiment with the drill-cultivator, still the upper two or three inches of soil was so extremely dry that the manurial applications remained almost in their original condition. Had the crop been a slow grower, even without a greater rainfall better results would have been obtained. In this instance, the maize was on the ground only for six weeks after the manure was applied.

I gather from this experiment that for crops which only remain three or four months on the ground, it will be the safest to apply the top-dressing before sowing the seed, instead of after the crop appears above ground. It is not desirable to bring the seed and these manures into contact; but this is easily managed; a single stroke of the harrow, after broad-casting the manure, and before the grain is sown, will suffice to prevent any damage being done to the seed.

Cumboo ("*Pennisetum Spicatum.*")

About two-and-a-half acres of land were sown with cumboo during the second week in June. Before sowing, the soil had been ploughed, harrowed, and weeded in the usual manner, and about five tons of foldyard manure had been spread broad-cast over its surface and ploughed in. Nine Madras measures or about twenty-five pounds of seed was used. It was sown about one inch deep, and in lines twenty-two inches apart.

The crop was cultivated two or three times by the drill cultivator. It grew vigorously, and reached an average height of from eight to nine feet.

At this stage in its growth I cut down an average portion of the crop on about 250 square yards, and found the yield to be 1,268 pounds of green fodder, equivalent to 18,000 pounds per acre. This green fodder was given to the cattle; they ate it freely, and throve very satisfactorily upon it. An idea is prevalent amongst ryots that cattle will not eat cumboo straw. They certainly do not care for the dry cumboo straw which has matured its grain, but they are quite as fond of it in the green state as they are of green cholum and other green fodders. The following experiment was made with green cholum and green cumboo straw :—

—	Bullock fed on green Cumboo fodder	Bullock fed on green Cholum fodder.
	lbs.	lbs.
July 18th	302	214
July 26th	310	217
Increase	8	3

This experiment was conducted over much too short a period to produce results of any practical value. It however proves that not only will cattle eat green cumboo fodder, but that they will thrive upon it.

The remainder of the crop was allowed to seed; it was harvested on the 9th of September, and yielded 1,672 pounds of grain, about 668 pounds per acre. The straw was not weighed, but it certainly would not be less than three tons per acre; valuing the grain at twenty measures per rupee, and the straw at 5 rupees per ton, at which price a greater part was sold, we have the value of the crop at about 27 rupees per acre. Valuing the manure at 1 rupee per ton, and the cost of cultivation at the usual rates, the total cost of producing the crop of cumboo did not exceed 12 rupees per acre, leaving a balance of rupees 15. One or two other plots of cumboo were sown at about the same time with very similar results.

We found the cumboo crop very valuable; it afforded us an abundant supply of green fodder at a time when, in this neighbourhood, it is usually very scarce. We can always manage to have something green for the stock between the months of October and May; but the great difficulty has hitherto been to find some crop that will yield green fodder during the months of June, July, and August. Of course, under irrigation, it is possible to grow yellow cholum so as to afford a supply of green fodder throughout the hot season, but there are large tracts of country to which irrigation cannot be applied, in which cumboo will yield excellent green fodder during the season when the stock feeder finds it the most difficult to maintain the condition of his animals.

Shamay ("*Panicum Miliare.*")

A piece of poor sandy soil, about two acres in extent, which was last under cholum, was ploughed, harrowed, weeded, and, after being manured with ten tons of mixed manure, ashes, foldyard manure, &c., was sown with fifteen pounds of Shamay seed. The seed was drilled in lines twenty-two inches apart.

The heavy rain in October gave the crop a good start.

The weather was very unfavourable when the seed began to form, and the yield of grain was considerably less than might, under less unfavourable circumstances, have been expected.

The crop was cut on the 1st of March, and yielded 541 pounds of grain, worth, at present market price, rupees 25. The straw would weigh about twenty cwts., and be worth other 5 rupees.

Shamay is easily grown; and, though it is not a very remunerative crop, it nevertheless is well-worth the attention of dry land farmers, who have a very limited number of crops to select from.

The total expenses of cultivation did not exceed 15 rupees, leaving a profit of 10 rupees per acre.

Egyptian Clover.

This is a white variety of clover; it was obtained from Suez. The seed was sown on the 29th of October, and came up very satisfactorily; it produced a few flowers, but the hot weather experienced about this time injured it very much, and the plants gradually died away.

It was cultivated as a dry crop. Probably, under irrigation, the results would have been different. I intend, next season, to sow some along with hurrialee grass on a new water-meadow I am laying out.

Tobacco.

A number of samples of tobacco seed were obtained from the different tobacco-growing districts.

A plot of free soil, about three-fourths of an acre in extent, was selected for seed beds. It was deeply ploughed, and was afterwards well dressed with manure, and again deeply dug with digging forks. The soil was thoroughly cleaned and reduced to a very fine tilth. It was then divided in beds three feet broad, with a water channel between each bed.

The various samples of seed were sown in the beginning of January. Three lines of seed were sown along each bed; it was sown very carefully, and just covered with soil. Usually an ounce of seed is considered enough to produce sufficient plants for an acre of land; but in this instance no special care was taken to regulate the quantity sown to the area to be planted. After sowing, the beds were covered with palmyra leaves, and water was applied by means of watering pots until the plants appeared above the ground. The palmyra leaves were then removed, and the ground kept wet by allowing water occasionally to pass down the intervening channels. The ground was carefully weeded and kept damp until the plants were about four inches in height, when, for a few days, water was given very sparingly, thus hardening the plants before transplanting.

Two or three plots of well-manured soil having been prepared, the seedlings were planted out in lines three feet apart, at intervals of three feet, after which they were watered in the usual manner every three or four days.

On one of the plots, the plants having reached a height of eighteen inches, have begun to flower; but as fast as the buds appeared they were carefully pinched off, and so also were all suckers or shoots from the stem. The number of leaves was also reduced to six or seven, and, on the larger plants, to nine or ten. On several of the plots the plants were, on March 31st, looking as well as could be desired; but, owing to the parching hot weather of the past few weeks, we have experienced great difficulty in transplanting out the crop. We found that palmyra leaves answered very well during the first three or four days for protecting the young plants from the effects of the sun. But, on a large area, this is not practicable. We have tried planting out in the evening, but this has not produced much better results. I am afraid that our heavy monsoon would destroy the plant, or I should much prefer to sow before the monsoon, and to plant out immediately after the rains. In Australia and other countries it is usual to protect the young seedlings from the effects of heavy rains by covering them with calico spread on poles; but I am afraid that this would be useless here.

Instead of planting in seed beds and afterwards transplanting into the fields, I have found it a good plan to sow at once in the field. In a dry hot season this plan has many advantages over transplanting; but there is always a great waste of seed, and it is difficult to raise such good plants as when the nursery plan is adopted.

Yellow Cholum ("Holcus Sorghum").

A considerable area of land, chiefly the newly reclaimed land, was sown with this crop. The seed was put down in October in the usual manner.

The crop grew very satisfactorily on the less exhausted soils, and produced a very fair yield of excellent seed, particularly free from blight. On the exhausted and inferior soils the crop was not allowed to seed; it was cut down whilst green, and used for feeding stock.

Harvesting commenced in the early part of February, and was completed by the middle of the month.

Nearly 3,000 pounds of good seed is now available for distribution.

A large amount of valuable fodder was obtained, which will be of great use during the approaching dry season. The general results were much the same as are detailed in last year's Report.

Egyptian Beans.

A supply of this bean, which now is exported so largely to England, was obtained from Suez. They were sown on the 13th of October on a piece of very good soil. They came up very regularly, and as long as the weather continued showery, looked very healthy, but on the cessation of the showers they became stunted and flowered when only six inches high. The flowers fell off nearly as fast as they appeared. Seeing no prospect of the plants yielding any seed, I had the crop ploughed in.

Tennay ("Panicum Italicum").

Two plots of very inferior sandy soil, measuring together three-fourths of an acre, were sown with tennay on the 21st of November. The land was manured with about three tons of farmyard manure. The soil was ploughed, harrowed, and weeded before the seed was sown. The seed used weighed 13¾ pounds; it was sown in drills about twenty-two inches apart. The weather was very dry during the whole of the time this crop was on the land, the total rainfall being only 4·23 inches.

The crop was harvested on the 1st of March, and yielded 143 pounds of seed. The weight of straw was not ascertained; it would probably yield one ton per acre, and, as it is worth as much as paddy straw, which it resembles very much in appearance, would be worth 7 or 8 rupees. This would do more than repay expenses, leaving the grain to pay rent, &c. True, this result is not a very satisfactory one; still it is as good as could be expected on such a wretched soil, and under such unfavourable circumstances.

On a better soil, and with the usual rainfall of November and December, the crop will be a remunerative one in this district, and it will alternate very well with gram, indigo, &c.

Rape.

A supply of rape seed was obtained from Egypt and Australia. Both lots of seed grew satisfactorily. The seed was sown on the 29th of October in drills twenty-four inches apart. When about four inches high a large number of plants were thinned out, leaving the standing plants about a foot apart. They suffered for a time from the depredation of caterpillars, but soon recovered. The crop, seeing that it was cultivated entirely without irrigation, was a very satisfactory one, but a crop of ordinary kohl rabi could have been raised as easily, and certainly would have yielded a much larger quantity of food; all kinds of stock eat the rape readily.

Varagoo ("Panicum Miliaceum").

This does not appear to me to be a crop worth much attention. The grain is very inferior, and commands a very small price in the bazaars, while it is a very slow grower, and occupies the land a long time.

We have about two acres under this crop last year. The soil was prepared in the usual way, and manured with five tons of fold-yard manure per acre. About twenty-four pounds of seed was sown in drills twenty-two inches apart in the early part of October. The crop was harvested on the 1st of March, and yielded 456 pounds of grain. The straw would not weigh more than half a ton per acre.

This result would do little more than pay expenses.

Cotton.

Though our soils are anything but cotton soils, I nevertheless felt justified in setting apart a few acres for the experimental growth of cotton. I had no hope of producing extraordinary results either in yield or quality, still I believed that though our land contains nearly eighty per cent. of sand, I would, on a properly manured soil, be able to produce such results as would *justify* the culture of cotton on a very much larger area of country than has hitherto been thought capable of carrying this crop.

The fertility of these sandy soils (the result of manure and cultivation) is of rather a fleeting character; and, unless carefully dealt with, will soon be replaced by sterility. In growing cotton on such soils, it therefore behoves the cultivator to act with great caution, and so to arrange his cropping that while he grows as much cotton as possible, he also has a just proportion of feeding or restorative crops.

Acting on this view, I selected a 5-acre field and sowed it with alternate rows of maize and cotton. True, I might have attained the same end, that is, provide against the future exhaustion of the soil, by dividing the field in two halves, and sowing one with maize and the other with cotton; however, by alternating the rows of maize and cotton, I gained *more than this*. I economised my space, and gave each crop plenty of room without sacrificing any land. It must be remembered that maize has an upright habit in growth, while cotton has a side or lateral growth. The crop was sown in drills three feet apart, certainly much too close had the whole of the land been entirely sown with cotton, still wide enough for the cropping adopted. The maize was first sown in drills six feet apart, and after it had reached a height of six or eight inches, a line of cotton was introduced between each line. The maize was harvested, and the ground ploughed before the cotton had begun to put out its lateral branches.

The cotton was sown on the 29th of October, at the rate of about six pounds per acre, in drills six feet apart. It was hoed

both by manual and bullock labour. In spite of the very dry weather experienced, and the late season at which it was sown (the seed did not reach us until the last week in October) the crop has thriven very satisfactorily; it is now (March 31st) in full flower, and promises to give a fair yield.

June 5.—Has already yielded 2,000 pounds = 120 pounds of clean cotton per acre, and further gatherings are expected, and this, in addition to a crop of maize.

To the kindness of Honorable J. D. Sim, C.S.I., I am indebted for a supply of Markham's Yeo Valley cotton. This cotton, I believe, is now in the fifth generation, and is, in the strictest sense, a pedigree cotton. The seed (as there was unfortunately only a very small supply) was sown in chatties in June last; and after being sprouted was planted out in the field at distances six feet apart in each direction on a well-prepared plot of land measuring 900 square yards. After the plants had reached a height of five feet it was found that they were too crowded, and about a third were transplanted into another plot measuring 600 square yards. The plants bore transplanting very well; they certainly lost their leaves and a greater part of their greenwood, but they soon recovered, and though not so large as those in the original plot, are nevertheless very healthy. The plants are now bearing, and promise a fair return. The bolls are very large, and the staple long and silky. I hope from this crop to get as much as will enable me next season to sow ten or twelve acres of this valuable cotton.

When clearing some waste land near the farm buildings, Mr. Overseer Wilkins drew my attention to a few cotton plants heavily laden with bolls. I had the seed saved, and afterwards sowed it carefully in a piece of land measuring 270 square yards. A crop of cotton has just been collected of these plants; it weighs * fifty pounds, or 850 pounds per acre in the uncleaned state. The bolls are small, and the staple is short; but it is fine and separates very easily from the seed. This cotton grows very readily, and seems well suited to a low order of agriculture. It is, I may here add, as necessary to suit the seed as it is to suit the stock to the agriculture of a district: the same disastrous results will attend the introduction of a high class of plants as of a high class of stock into a district where the agricultural practice is of the lowest type. In this I think we have the explanation of the many failures which have attended the attempted introduction into this country of many well-known and valuable varieties of cotton.

Fodder Crops.

Instead of there being a scarcity of fodder crops in this country, my experience has satisfied me that the Indian farmer is most bountifully supplied with these crops; indeed in this respect he is much better off than our English farmers.

The Indian farmer has a great diversity of fodder crops at his command; he has crops that will grow in the hot weather and in the cold weather; on clay and on sandy soils; under wet or under dry cultivation.

In this country a couple of months will suffice to produce a crop that in England could only be produced in double the time. Besides, many of these Indian forage crops are very rich in saccharine matter.

Amongst the crops which we have experimented with, as fodder-producers, are yellow cholum (holcus sorghum), Chinese sugar-cane (sorghum saccharatum), cumboo (penicillaria spicata), horse gram (dolicus uniflorus), and common paddy. I have elsewhere given full details regarding our experiments with these crops, and now merely summarise the general results:—

Crops.	Weight per Acre of Green Fodder.	Average Number of days required to produce a Crop.
	lbs.	Days.
Yellow cholum (dry)	10,000	65
Yellow cholum (wet)	12,000	80
Chinese sugar-cane (dry)	20,000	80
Cumboo (dry)	12,000	75
Horse gram (dry)	7,000	70
Paddy (wet)	8,000	85

Let these results be compared with the results which attended our attempted cultivation of English forage crops such as clover, lucerne, rye-grass, rape, &c., or of English root crops mangold, wurtzel, khol rabi, &c. If half the time and money which has been wasted in the attempt to introduce these crops had been devoted to the improvement of indigenous or tropical forage crops, the Indian stock breeder or feeder would have been in very different circumstances to those in which we now find him.

Cropping.

The following examples of dry land cropping will give some idea of the capabilities of these sandy soils when fairly treated:—

* May 20th 1871.—Another gathering of cotton has been taken off this plot, making the total yield sixty pounds, or 1,075 pounds per acre, equal to 215 pounds per acre of clean cotton, and a further gathering is expected.—W. R. R.

Field No. 18, East side.

Date of Sowing.	Date of Reaping.	Nature of Crop.
3rd August 1869	13th October 1869	Horse Gram cut for fodder.
15th October	9th January 1870	Bangalore Maize.
16th January 1870	12th March	Horse Gram cut for fodder.
10th June	3rd September	Dingally.
13th October	3rd February 1871	Yellow Cholum.
3rd March 1871	...	Tobacco.

In this instance the land bore six crops in twenty-one months.

The following shows the cropping and yield per acre of another piece of similar land:—

Date of Sowing.	Date of Reaping.	Nature of Crop.	Yield per Acre. Straw.	Yield per Acre. Grain.
			lbs.	lbs.
3rd August 1869	13th October 1869	Gram fodder	7,562	..
25th October	6th February 1870	Queensland Maize	7,548	836
14th June 1870	7th September	Cumboo	6,000	600
10th October	25th January 1871	Sorghum	21,066	1,003
8th February 1871	.....	Tobacco	..	..
		Total	42,321	2,100

CATTLE AND SHEEP-FEEDING EXPERIMENTS.

Cattle-feeding Experiment.

EXPENDITURE.

Commenced feeding.	Live weight of Animal.	Cost of Animal.	Food consumed. Maize	Food consumed. Tour.	Food consumed. Bran.	Food consumed. Ground-nut Cake	Food consumed. Cholum straw	Food consumed. Paddy straw	Cost of Food.	Cost of attendance, &c.	Total cost.
1869.	lbs.	rs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	rs. a. p.	rs. a. p.	rs. a. p.
Feb. 20th	476	15	182	...	..	176	1,108	850	17 13 8	2 0 0	34 13 8
Do. 22nd	464	15	120	...	...	120	983	348	12 1 8	1 8 0	28 9 8
Do. 23rd	467	15	..	...	101	96	800	418	9 8 7	1 4 0	25 12 7
Do. 26th	410	15	..	90	408	716	2,388	1,234	41 5 7	5 0 0	66 5 7
Do. 28th	510	15	187	16	126	..	1,043	770	15 6 0	1 12 0	32 2 0
Do. 30th	376	15	216	40	141	...	1,298	1,000	21 1 8	2 4 0	38 5 8

RECEIPTS.

Date when killed.	Live weight on day of killing.	Pounds of Beef.	Per cent. of Beef.	Sum realised for Beef.	Value of Manure.	Total Receipts.	Profit.
1869	lbs.	lbs.		rs. a. p.	rs. a. p.	rs. a. p.	rs. a. p.
June 16th	532	219	42·0	40 8 9	1 7 4	49 14 1	15 0 [illegible]
May 21st	516	214½	41·47	40 3 0	0 15 6	40 3 6	27 8 10
Do. 7th	..	221	..	40 15 6	0 11 9	40 11 3	22 14 [illegible]
Jan. 1st	...	264	..	53 11 6	5 4 4	58 15 10	2 10 3
June 4th	570	244½	42·90	51 3 0	1 2 0	52 5 0	20 8 0
July 6th	Sold alive.		...	46 0 0	1 11 9	46 11 9	8 6 1

The animals formed "one lot"; they were purchased at 15 Rs. each.

Their food was charged at the following rates:—

	Pounds.	
Ground-nut cake	60	per rupee.
Maize	42	"
Tour	120	"
Bran	48	"
Cholum straw	375	"
Paddy straw	112	"

These charges include cost of chaffing, crushing, and preparing the food.

One man, at 5 rupees per month, can easily attend feeding cattle. The loose boxes cost each about 12 rupees. The charge under column headed "Attendance, &c.," is composed of a monthly charge of 6 annas per head for attendance, &c., and 2 annas per head to pay interest, &c., on cost of box.

With one exception the cattle were all slaughtered and sold on the Farm. The average price obtained for the beef was 1 annas per pound.

One-fifth of the cost of cake, corn, and bran, &c., is credited for manure.

CATTLE AND SHEEP-FEEDING EXPERIMENTS.

The following experiments were made to test the feeding values of gram fodder, grass, cholum fodder, and guinea grass:—

Cattle-feeding Experiment.

Date of Weighing.	Bullock fed on cholum fodder.	Bullock fed on grass.	Bullock fed on guinea grass.	Bullock fed on gram fodder.
	Pounds.	Pounds.	Pounds.	Pounds.
February 2nd.....	343	384	287	360
Do. 12th.....	349	406	308	375
Do. 22nd	335	415	310	373
March 4th.....	359	423	313	385
Do. 14th.....	367	431	329	396
Do. 24th	383	430	331	403
Increase	40 lbs., or 13 per cent.	46 lbs., or 12 per cent.	44 lbs., or 15 per cent.	43 lbs., or 12 per cent.

The animals had as much of the green food as they could consume, and the same quantity of corn and cake was given to each.

Sheep-feeding Experiment.

A number of sheep were put up to feed on the 2nd of February. The same quantity of corn and cake was given to each lot of animals. One lot was fed on gram fodder, another on cholum fodder, and the third on grass.

Date of Weighing.	Average weight of sheep fed on cholum fodder.	Average weight of sheep fed on grass.	Average weight of sheep fed on gram fodder
1870.	Pounds.	Pounds.	Pounds.
February 2nd	39·8	40·0	39·9
" 12th	40·6	40·0	40·6
" 22nd .. .	42·0	39·2	42·5
March 4th .. .	42·4	41·4	43·4
" 14th	45·2	44·8	45·2
" 24th	46·0	46·8	47·6
Increase .. .	6·2 lbs., or 15·5 per cent.	5·8 lbs., or 14·5 per cent.	7·7 lbs., or 19·3 per cent.

REPORT ON PUMPS, WATER-LIFTS, &c., AT THE GOVERNMENT EXPERIMENTAL FARM.

Steam Water-lift.

This is an enlarged copy of Burgess and Keys' Water-lift. It consists of thirty-nine buckets on an endless chain. Each bucket contains 210 pounds 7 ounces of water, about 21 gallons. The depth of the well is 28 feet. The water-lift is driven by an eight-horse power portable engine.

Owing to the imperfect construction of this machine, fully one-third of the water raised falls again into the well. Instead of twenty buckets throwing 420 gallons into the channel, it has been ascertained, from actual measurement, that the quantity does not exceed 310 gallons.

Driving at the rate of twenty buckets per minute during a day of nine working hours, 216,000 gallons of water is raised; however, of this quantity only 166,320 gallons is utilized, the remaining 49,680 gallons falling again into the well.

Daily cost of working the lift, &c.:—

Time occupied in raising steam one hour, in working nine hours, total ten hours.

Consumed 1,870 lbs. of split wood, valued at Rupees 3 8-0 per thousand pounds.

The engine was worked at 40 lbs pressure.

The machinery, engine, &c., was valued at Rupees 3,000. The engine itself was valued at Rupees 1,000, the price at which a similar engine was offered in Madras.

Summary Daily cost.

	Rs.	a.	p.
Value of wood	6	8	8
1 Driver	1	2	0
1 Stoker	0	3	0
1 Water Carrier and Assistant	0	3	0
Oil, &c.	0	6	0
Interest and wear and tear, at 10 per cent. per annum on value of engine, lift, gearing, &c., charged over fifty-two working days per annum	5	12	3
Total..	14	2	11

The cost of lifting 10,000 gallons of water 1 foot high, is 4·31 pie; however, as only two-thirds of the water raised is available for irrigation, the actual cost is 5·72 pie.

Second Estimate.

The cost of raising water by the lift may be calculated in another way:—The engine may be valued at cost-price with the carriage to Madras added; and it may be assumed that it is regularly worked, say, during 300 days a year, thus:—

	Rs.
Cost of water, lift, gearing, Brickkyrsee and Coopers' time in erecting the same	1,000
Value of eight-horse-power portable engine and carriage to Madras	2,000
Total..	3,000

As the engine will in this case be working nearly six times as many days in the year as the other worked, 10 per cent. will not cover interest and wear and tear; I therefore charge 15 per cent. per annum; this makes an annual charge of Rs. 750; this sum divided over 300 working days gives a daily charge of Rs. 2-8-0.

Summary of Daily cost.

	Rs.	a.	p.
Value of wood	6	8	0
1 Driver	1	2	0
1 Stoker	0	3	0
1 Water Carrier and Assistant	0	3	0
Oil, &c.	0	6	0
Charge for interest and wear and tear	2	8	0
Total...	10	14	0

The cost of lifting 10,000 gallons of water 1 foot high would be, with the lift in its present imperfect state, 4·48 pie, or, if the lift can be altered, so as to allow of all the water raised being utilized, only 3·45 pie.

* IMPROVED WATER-LIFT IN NO. 13 WELL.

This lift is similar in construction to that already described.

The depth of the well from point of discharge to the surface of the water is 18 feet.

There are thirty-nine buckets, each bucket holds 4·85 gallons of water.

Fifteen buckets are emptied during each revolution the bullocks make round the well.

The bullocks make seventy-five revolutions in an hour.

The cost of machinery was 450 rupees.

The daily cost of one pair of bullocks is 1 rupee, driver 3 annas.

Summary of Daily cost.

	Rs.	a.	p.
Bullock labour	1	0	0
Driver	0	3	0
Interest and wear and tear, at 15 per cent. per annum on outlay charged on 300 working days	0	3	7
Oil, &c.	0	1	0
Total...	1	7	7

Cost of raising 10,000 gallons of water 1 foot high, 3·18 pie.

WATER-LIFT IN NO. 4 WELL.

Burgess and Keys'.

This is the original water-lift; it was made in England by Burgess and Keys; from this the other water-lifts were constructed.

The depth of the well from the point of discharge to the surface of the water is 22 feet.

The bullocks make ninety revolutions per hour.

Nine buckets are emptied during each revolution.

Each bucket holds 3½ gallons.

The value of machinery, &c., is rupees 380.

The daily cost of the working bullocks is 10 annas, and driver 3 annas.

Summary of Daily cost.

	Rs.	a.	p.
Bullock labour	0	10	0
Driver	0	3	0
Interest and wear and tear on capital invested, at 15 per cent. per annum charged over 300 working days ..	0	3	0
Oil, &c.	0	1	0
Total ...	1	1	0

Cost of raising 10,000 gallons of water 1 foot high, 3·63 pie.

DOUBLE SHOTE.

This is the ordinary "Whim." The water is raised in skin buckets by means of a rope wound over a drum which is turned by a single bullock. There are two buckets; one bucket ascends, whilst the other descends.

Depth of well from point of delivery to the surface of the water is 22 feet.

Contents of bucket when at point of discharge, 30 gallons.

Number of buckets raised per hour, 60.

Daily cost of working one bullock 8 annas, one driver 3 annas.

* Referred to as Bucket Pump in Proceedings of Government, dated 23rd May 1870.

Cost of machinery, Carpenters' and Bricklayers' time, chunam, &c., [illegible] 70.

Cost of [illegible] and pipes, [illegible].

Summary of Daily cost.

	Rs.	a.	p.
Daily cost of working	[illegible]	[illegible]	[illegible]
Interest and wear and tear on cost of machinery, labour, [illegible] at 15 per cent. per annum [illegible] working days	0	0	2
[illegible] three times a year	0	1	0
[illegible]	0	3	0
Total..	1	4	4

Cost of raising 10,000 gallons of water 1 foot high, 4·00 pie.

THE SINGLE MHOTE.

The depth of well from point of discharge to surface of water is [illegible] feet.

Contents of bucket when at the point of discharge, 35 gallons.

Number of buckets raised per hour, 40.

Daily cost of working one pair of bullocks with driver, 1 rupee.

Cost of masonry and carpentry works, pulleys, frame, cisterns, &c., 500 rupees.

Cost of bucket and rope, &c., 20 rupees.

Summary of Daily cost.

	Rs.	a.	p.
Bullock labour and attendance	1	0	0
Interest and wear and tear on capital invested in masonry and carpentry works, at 15 per cent. per annum charged over 300 working days	0	0	4
Cost of replacing bucket and rope four times a year, charged over 300 working days	0	4	4
Total..	1	4	8

Cost of raising 10,000 gallons of water 1 foot high, 6·75 pie.

When raising the bucket, the bullocks walk down an inclined plane; the slope is about 36 feet long, and falls about 8 feet; as the buckets descend for water, the bullocks are backed up the slope again. This part of the work is very injurious to the bullocks.

PICOTTAH.

The depth of well from the point of discharge to the surface of water is 13 feet.

Contents of bucket at the point of discharge, 9 gallons.

Number of buckets raised per hour, 250.

Number of men required to work picottah, 3.

Value of picottah, bucket, cost of erecting, &c., 10 rupees.

Summary of Daily cost.

	Rs.	a.	p.
3 Coolies	0	9	0
Assuming that the picottah, &c., will require to be replaced once a year, and charging over 300 working days	0	0	6½
Total...	0	9	6½

Cost of raising 10,000 gallons of water 1 foot high 4·76 pie.

NORTON'S PUMP.

With rotary motion.

The depth of well from the point of discharge to the surface of the water is 25 feet.

Forty-eight strokes raised 3½ gallons.

4,500 strokes per hour.

Value of machine, &c., 40 rupees.

Daily cost of working, 3 annas.

Summary of Daily cost.

	Rs.	a.	p.
Manual labour...	0	3	0
Interest and wear and tear on sum invested, at 15 per cent. per annum charged over 300 working days ...	0	0	4
Oil, &c.	0	0	2
Total..	0	3	6

Cost of raising 10,000 gallons of water 1 foot high, 8·40 pie.

DOUBLE BUCKET PICOTTAH.

Depth from point of discharge to surface of water, 7·50 feet.

Contents of bucket when at the point of discharge, 5 gallons.

Number of buckets raised per hour, 700.

Worked by two coolies.

Value of picottah and bucket, rupees 10.

Summary of Daily cost.

	Rs.	a.	p.
2 Coolies	0	6	0
Assuming the picottah and bucket will have to be replaced once a year, and charging over 300 working days	0	0	[illegible]
Oil, &c.	0	0	[illegible]
Total..	[illegible]	[illegible]	[illegible]

Cost of raising 10,000 gallons of water 1 foot high, [illegible] pie.

ARCHIMEDEAN WATER-LIFT.

Length of barrel, [illegible] feet.

Diameter of barrel, [illegible] feet.

Depth from the point of discharge to the surface of water, 9 feet.

Worked by one man.

Value of machine, [illegible] rupees.

Raised 2,800 gallons per hour.

Summary of Daily cost.

	Rs.	a.	p.
1 Coolie	0	3	0
Interest and wear and tear, at 15 per cent. per annum charged over the working days	[illegible]	[illegible]	[illegible]
Oil, &c.	[illegible]	[illegible]	[illegible]
Total..	0	3	4

Cost of raising 10,000 gallons 1 foot high, 8·30 pie.

SINGLE PICOTTAH.

Depth of the well from the point of discharge to the surface of the water is 8·75 inches.

Contents of bucket at point of discharge, 6·63 gallons.

Worked by one man.

Number of buckets raised per hour, 250.

Value of picottah and bucket, rupees 6.

Summary of Daily cost.

	Rs.	a.	p.
1 Coolie	0	3	0
Assuming that the picottah, &c., will require replacing once a year, and charging over 300 working days	0	0	3½
Oil..	0	0	1
Total	0	3	4½

Cost of raising 10,000 gallons 1 foot high, 3·73 pie.

ROORKEE PUMP.

Depth from the point of discharge to the surface of the water is 7½ feet.

Worked by two men.

Raised 1,500 gallons per hour.

Value of pump, Rs. 70.

Summary of Daily cost.

	Rs.	a.	p.
2 Coolies	0	6	0
Interest and wear and tear, at 15 per cent. per annum on value charged over 300 working days	0	0	4
Oil	0	0	1
Total...	0	6	5

Cost of raising 10,000 gallons of water 1 foot high, 7·6 pie.

SUMMARY.

	Cost of raising 10,000 gallons of water 1 foot high. Pie.	Equivalent in terms of a Penny.
Steam Power.		
Large water-lift, in its present imperfect state :—		
First estimate	6·75	·71
Second estimate	4·81	·50
Assuming that it can be altered, so as to allow of all the water raised being utilized :—		
First estimate	4·51	·56
Second	3·45	·43
Bullock Power.		
Improved water-lift	3·16	·39
Water-lift, Burgess and Keys' original	3·69	·46
Double Mhote	5·00	·62
Single Mhote	6·75	·84
Manual Power.		
Norton's Tube Pump	8·40	1·05
Picottah	4·76	·59
Archimedean Pump	8·30	1·03
Rooree Pump	7·61	·94
Double Bucket Picottah	3·33	·41
Single Picottah	3·73	·46

EXPERIMENTS WITH FARM MACHINES.

MAIZE-SHELLER.

Ransome and Sims'.

Cost, including carriage to Madras, 170 rupees.

Worked by three coolies.

In a day of nine working hours shelled 2,150 pounds of cobs.

Summary of Daily cost.

	Rs	a.	p.
Labour	0	9	0
Interest and wear and tear, at 15 per cent. on value charged over 300 working days	0	1	4
Oil, &c.	0	0	1
Total..	0	10	5

Cost of shelling 1 ton of cobs, annas 7-4.

MAIZE-SHELLER.

W. G. Ainsworth's.

Value of machine, rupees 37-8-0.
Worked by two coolies.
In a day of nine working hours it shelled 4,500 pounds of cobs.

Summary of Daily cost.

	Rs.	a.	p.
Labour	0	6	0
Interest and wear and tear, at 25 per cent. on value charged over 300 working days	0	0	9
Oil, &c.	0	0	1
Total..	0	6	10

Cost of shelling 1 ton of cobs, annas 3-8.

BULLOCK POWER CHAFF-CUTTER AND GRAIN-CRUSHER.

Cost of machine in England, 365 rupees; to this must be added carriage to Madras, say, 85 rupees, and 120 rupees the value of the bullock power.
Requires two coolies and one pair of bullocks to work it.

	Rs.	a.	p.
Estimating that the machine, &c., would cost 570 rupees at Madras, and charging interest and wear and tear at 25 per cent. over 300 working days, the daily cost will be	0	6	0
Daily cost for bullocks	0	12	0
2 Coolies	0	8	0
Oil, &c.	0	2	0
Total...	1	10	0

Work done in ninety minutes :—
Chaffed to 1 inch 550 lbs. of maize straw crushed 160 pounds of gram. Deducting the value of the work done in crushing gram, the cost of chaffing 1 ton of maize or cholum straw is R. 1, A. 1, P. 3.

COMBINED MILL.

Ransome and Sims'.

Cost in England, 100 rupees; carriage, packing, re-making, the total cost in Madras, rupees 165.
Crushed 400 lbs. of gram in one-and-a-half hour, worked by two men.
Broke 440 lbs. of oil-cake in one hour, worked by three men.

Summary of Daily cost.

Gram-crushing.	Rs.	a.	p.
2 Men	0	6	0
Interest and wear and tear, at 15 per cent. on 165 rupees charged over 300 working days	0	1	4
Oil, &c.	0	0	2
Total ..	0	7	6

Cost of crushing 1 cwt. of gram, 4·67 pie.

Summary of Daily cost.

Cake-crushing	Rs.	a.	p.
3 Men	0	9	0
Interest, &c., as above	0	1	4
Oil	0	0	2
Total..	0	10	6

Cost of crushing 1 cwt. of cake, 2·61 pie.

CHAFF-CUTTER.

Manual Power.

Cost, rupees 36.
Requires two men.
Cut 144 pounds in three hours.
Interest and wear and tear, at 15 per cent. charged over 300 working days in the year.

Summary of Daily cost.

	Rs.	a.	p.
2 Men	0	6	0
Interest and wear and tear..	0	0	4
Oil, &c	0	0	2
Total..	0	6	6

Cost of chaffing 1 ton of cholum or maize straw, Rs. 2-1-8.

Summary.

	Rs.	a.	p.	Equivalent in English money.	
Cost of shelling 1 ton of maize cobs by Ransoms and Sims' Machine ..	0	7	4	0	21
Cost of shelling 1 ton of maize by Ainsworth's Machine	0	6	0	0	18
Cost of chaffing 1 ton of maize or cholum straw by bullock power chaff-cutter	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cost of chaffing 1 ton of maize or cholum straw with manual power chaff-cutter ..	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cost of crushing 1 cwt. of gram by Ransoms and Sims' combined Mill	0	0	[illegible]	[illegible]	[illegible]
Cost of crushing 1 cwt. of oil-cake by Ransoms and Sims' cake-crusher	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MISCELLANEA.

TO MAKE A EWE OWN A STRANGE LAMB.

(From the American Agriculturist.)

Ewes recognize their own lambs by a peculiar odour, and by their voice, colour, and form. Sometimes a good ewe loses her lamb, while another one has two. In such instances, it is much better to let the ewe that has lost her lamb have one of the twins to rear, instead of allowing them to suck their own dam, while a good ewe has no lamb. To make a ewe own the lamb of another, tie her in a close pen and put the lamb with her. If she is inclined to butt, or kick it, tie her head to the rack and her hind feet about four inches apart. If she will not butt the lamb, her head need not be tied. In a few days she will own it, and it will forget its own dam. By putting one of a pair of twins on a ewe that has lost her lamb, she may be saved serious injury from garget. A plan often successful is to remove the skin from the dead lamb, and place the whole or part of it upon the lamb to be introduced in its place.

FIX UP THE IMPLEMENTS.

During the winter every implement and machine that will be required next spring and summer should be overhauled and repaired. Examine the ploughs, and if they have been neglected and are rusty, wash off all the dirt, and then apply with a swab fastened on the end of a stick, a mixture of one part sulphuric acid, and two parts water. Rub the mould board and other parts that are rusty with this liquid, until the rust is all removed; then wash it off and rub it dry. Then smear it over with crude petroleum or some other cheap oil, and next spring you will be saved from the loss and annoyance of clogging. Every farmer should buy a barrel of petroleum, and use it freely on all his waggons, machines, implements, &c. It will keep the iron from rusting and the wood from decay, and in cold weather it is a useful lubricating oil. We find it absolutely essential to keep on hand an assortment of uncut nuts, with the tools for making the thread in them, and also on the bolts. All these things can be obtained at a hardware store, and a farmer who buys them will never regret it. But if it is necessary to take anything to the blacksmith's shop, now is the time to do it, and when it is repaired, clean off the rust, paint it with linseed oil, and put it away for use in the spring. If the farmer or his son would go over all the implements, machinery, waggons, hay racks, tools, &c., paint them, oil and tighten the bolts, and see that every thing is strong and in good order, it would not only greatly lessen the blacksmith's bill, but would save much precious time and no little annoyance next spring and summer.

DEEP PLOUGHING SHOULD BE DONE GRADUALLY.

A correspondent who has one of the finest and most productive farms in Western New York, which he keeps in a high state of fertility by thorough cultivation and the growth of red clover, makes the following sensible remarks in regard to deep ploughing :—"A sudden bringing up to the surface of many inches of heavy clay, that has never been punctured by the roots of plants, and this too in the spring of the year, would probably injure the first crop. Clay subsoils are best brought to the surface two or three inches at a time, and that in the fall, so that the frosts of winter may mellow them down. The next spring plough, say twice as many inches deep as the clay subsoil, is thick. This will mix things up so that even a crop of corn would be much improved by the deep fall ploughing. If we had the power and tools necessary to go on with this process of bringing up the subsoil too and mixing it with the surface soil until we had one foot or more of mellow soil that had been enriched by turning under repeated clover crops, and then under this foot or more of soil, we could run a subsoil plough two feet deep, and so break the clay to a depth of three feet, the clover roots would have chance to bring to the surface the fertility that now lie dormant under the surface of our lands. This is the theory that I have constructed on the experience of a lifetime as a farmer; and I have no doubt of its applicability on our lands here. I do not think it would do on all lands, but it is practicable here, or at least will be, when we get the steam plough that can do the subsoiling for us. In the mean time we are doing the best we can in the direction I have indicated.

DEATH TO HALF-BREED CALVES.

Many a man is tempted by the beauty and promise of a half-breed bull-calf to keep him for the perpetuation of his good qualities.

This would be very well if only there were any hope of his doing it with even tolerable certainty; but there is not. The result of using such an animal as a sire is generally most unsatisfactory. The clown flat of a mongrel ancestry will constantly show itself in the most provoking manner, and there is really no safety if we wish to improve our stock, except in destroying at least the virility of every bull-calf that has not a clean recorded pedigree. We sometimes hear it said of an animal that "he carries his pedigree in his horns and in his hide." There can be no greater nonsense than this. The only pedigree of an animal that is worth anything is a positive knowledge that for many generations no strain of impure blood has been allowed to creep into his veins. This gives, then seek for the most perfect development of every valuable quality, but without this, the highest type of outward appearance may be only a mere and a delusion.

THOROUGH BRED MALES.

It is not within the means of the very large majority of farmers in this country or in any other, to raise only, or chiefly, expensive thorough bred stock. But it is within the power of everyone of them, or it soon would be if they cared for it, to breed only from thorough bred males. These belonging to a fixed type or race, perpetuate their peculiarities with much greater certainty than do mongrel bred animals, and they will almost always overcome, in a great degree, the defects of mongrel females, thus constantly elevating the grade of the animal towards the type of the purer race. This rule holds good with reference to every variety of farm stock, from horses to poultry. Sir John Fenwick, in the reign of Charles II., said that "every blood horse, even if he be the meanest hack that ever came out of Barbary, is so infinitely superior in courage, stoutness, and quality, both of bone and sinew, as well as blood, to the best cold-blooded mare that ever went on a shodden hoof, that he cannot fail to improve the stock, whatever may be his comparative standing among racers." And Sir John Fenwick was perfectly right, as the history, not only of running horses but of trotters, has amply proven: for there is not to-day a successful trotting horse in America who has not in his veins a very large proportion of thorough blood, derived probably through several generations from the side of the sire.

Cattle for the shambles are more economically fed and more rapidly raised to a larger size, if they have been sired by a thorough bred short-horn. Cows for the dairy are better and more profitable in proportion to the number of thorough bred sires, whose blood they carry. The commonest and coarsest sow will give far more easily kept and advantageously sold pigs, if those are sired by a thorough bred Essex, Sefton, or other boar of fixed type. That the same rule holds good in the poultry-yard no breeder need be told. And throughout the whole range, the cost of securing the services of thorough bred males is as nothing compared with the value of the result as shown in the progeny.

A WARNING TO YOUNG FARMERS.

A true record of the first year's experience of any tyro in agriculture would be, in almost every instance, a story of disappointment, failure, hard work, and sunken money. As in every other career, the school of experience is a dear and a hard school to learn in, and he who takes one acre or a hundred for his practising ground, if he has not learned his trade in advance, will, before his first year is over, need all his heroism to carry him through with a stout-heart.

We believe that there is hardly a limit to the possibilities of farming and gardening. One who understands his business, who has sufficient capital for his operations, a good soil, a good situation, and plenty of manure at command, may hope for a very large reward for his labour and superintendence. We rejoice therefore when we see any man or woman turning from other pursuits with the intention of making agriculture or horticulture a career. Only when we see them go head foremost into the thing,—undertaking a difficult trade without learning it, and seeking to get in a month the knowledge that a year cannot give,—do we shudder at the thought of the bitter things in store for them.

As a rule—a rule that has few exceptions—they will lose much more than a year's living expenses, and will learn much less than they could learn as working hands in the employ of a good farmer. If you, reader, want to become a farmer, or a florist, or a market gardener, take our advice:—Buy as many of the best books on the subject as you can find time to read, and hire out, as an irregular hand, with the best man you can find who is doing, practically, what you have made up your mind to do. Work for dear life, read, listen, and watch all that is going on; at the end of your year you will be able to start judiciously and well. You will have saved money, you will have saved time, and you will have gained information that five years of ignorant and expensive blundering could not have given you. There is no royal road to good farming, except the road through royal hard thinking, and working, and waiting.

DARK STABLES.

(From the Duchess Farmer.)

Any person who has felt the pain and inconvenience of coming suddenly from a dark room into the full blaze of day, will easily conceive the necessity of lighting a stable in a proper manner. This is too often neglected in confined stables, and the consequences are most distressing to a human observer. The poor horse, led suddenly out to his work, shows his pain quickly in unmistakable expressions, stumbles, and runs against anything that may happen to be near, until the eyes have in some degree accommodated itself to the new circumstances under which it is placed. Nor is this all; by a continuance of this change from darkness to sudden daylight, the eyes become seriously injured. The retina or sensitive nerve grows dull, and more or less useless; the horse's sight is injured; he starts and shies at objects which he sees imperfectly, and many a rider who has received a dangerous injury has to thank his inattention to this simple cause, rather than any vicious habit of the animal, to which it has been attributed. Blindness is almost certain to be caused by inattention to the above caution; but even blindness is less dangerous to the rider than imperfect sight.

SHRINKAGE OF GRAIN.

(From the Weekly Press.)

We have recently had an instance of a great loss of grain by shrinkage when it is kept a little time. The writer had a quantity carefully measured and put up in sacks. It remained in a cool barn in this way for three months. When the sacks were first filled the mouths could scarcely be tied, they were so full. At the end of three months, there was apparently plenty of room for more. For curiosity some of it was measured, and it was found that 2 qrts. per bushel had fallen away. This is a loss of about 7 per cent. The place where the seed was kept was very unfavourable to waste. There was no heat or wind to dry it up, and it may be taken as the very lowest percentage of loss. We have no doubt that under other circumstances, the loss by saving six months may often reach so high as 20 per cent. These things should be considered by those who are inclined to hold on for the chance of a rise. Another consideration strikes one here. People often complain that they get short weight or measure. No doubt this is too often the case; but it is likely that, in some instances, the difference is as much in shrinkage as in morals.

(From the Farmer.)

From a report lately published at St. Petersburg, by Mr. Morder, on the breeding of horses in Russia, it appears that the number of horse-fairs held in 357 towns and villages is 1,071 every year. The number of horses sold at these fairs is upwards of 300,000, at an average price of £9 each. The total number of horses in European Russia amounts to 19,226,067, or one to every three inhabitants.

A LARGE DAIRY.

It is said that the second largest dairy in America (the first being that of Mr. Charles Webb Howard, of California,) is located about 4 miles from St. Louis. There are 800 cows in the stable. They are attended by Swiss milkers. The chief food used is ground corn mixed with malt and oatmeal, cooked by steam. The average amount of material consumed per day is about 400 bushels of malt, 600 lbs. cut hay, 50 bushels of corn meal, 15 sacks of bran and oil meal; cut hay and bran mixed together, are also furnished. The summer pasturage of this Mammouth dairy embraces an area of over 1,000 acres of fine rolling land, with numerous springs of pure water. The average daily yield of milk at the present time is 800 gallons, with 80 gallons of cream.

The Planters' Gazette.

BOMBAY, 21st October 1871.

THE ESTATES.

The *Englishman* tells us that the following arrangements have been made in connection with the coming Looshai Expedition to avenge the raid of last season:—The three officers appointed to go with the Coolie Corps of the Cachar column are Major Moore, Captain Anderson, and Captain Hidayat Alí. With the Chittagong column there will be Major G. A. Brown, Captain Croham, and another officer not yet named. The representatives of the Commissariat Department will be—with the Cachar column, Colonel Davidson and Captain Marriot; and with the Chittagong column Colonel Mackenzie and Captain Case. Of these, Captain Marriott has already left for Cachar with a hundred coolies and stores, and Captain Case has left for Chittagong. Major Brown, with more stores and coolies, will leave in the *Undaunted* on the 2nd and 3rd proximo, and Captain Croham, of the 22nd Regiment, lately appointed to the Coolie Corps, will start about the middle of October. The last batch of coolies will go in the beginning of November, under charge of the third officer (not yet nominated) appointed to the Chittagong column. The total

number of coolies for each column will be two thousand, and the corps for the Chittagong column will go by the Sundarbans, striking across by Sandeep. The coolies will go by sea, the troops by inland steamers and flats, which we understand the Government has agreed to hire at the rate Rs. 500 *per diem*, all the Government steamers being engaged.

"The troops destined for the Expedition are—with the Cachar column, the 42nd and 44th Regiments, the 22nd Punjab N.-I., a Company of Sappers, and half a Battery (consisting of four guns) of the Peshawar Mountain Train. With the Chittagong column there will be the 2nd and 4th Ghoorkas, the 27th Punjab Native Infantry, a Company of Sappers, and half a Battery of the Peshawar Mountain Train. The Artillery goes without mules, as the guns are to be carried on elephants. A hundred elephants for carriage will accompany each column. The detachment of the 22nd Regiment at Barrackpore will furnish as many men as are required to make up (with the men to be picked up *en route* at the head-quarters at Dacca) five hundred men. They will embark at Calcutta with one of the Companies of Sappers, go up to Dacca, where they will be joined by the rest of the 22nd, and go on to Chattak. There a steamer will probably be obtained by Government, failing which, they will have to go in country boats. We have not heard what Regiment is to replace the 22nd at Barrackpore. According to present arrangements, the columns are to be in readiness to move by the 20th of November, and operations will probably commence in the first week of December. Provisions are, we believe, being made for three months in the field and two months marching. There will probably be a good deal of soldiering to be gone through, and, provided that the health of the troops does not suffer, the experience gained will be most valuable. The camp-following is to be strictly limited, each officer being allowed only one servant and one coolie to carry the authorised twenty seers of luggage, one syce and a grass-cutter to every two officers. The twenty seers of luggage allowed must, we understand, include *everything*, so that tents and luxuries of every kind will be evidently out of the question. Staff Officers are, we are told, to be allowed an extra half-maund of luggage, and General and Commanding Officers one maund."

We understand (says the *Pioneer*) that orders have been received by the Executive Commissariat Department at this Station to engage two hundred coolies for the Looshai Expedition. These men are to be employed in carrying dhoolies, litters, ammunition, and in the making of roads, cutting jungle, bringing in wood for fuel, and all the minor duties of the soldier, so as to save the fighting men as far as possible. The terms are not only to our mind liberal, but munificent, *viz.*, chowdries of 100 men to receive 12 per mensem, mates of 25 men 10 per mensem, and each coolie 8. A *dao* or *kookrie*, will be issued to each coolie by Government, also one blanket, a pair of shoes, and a flannel jacket, and a metal badge with his number. From the date of leaving Calcutta to date of return each man will be provided with free rations by the Commissariat on the scale of public establishments. The engagement to be for eight months, and all those invalided will be sent back to their homes at the expense of Government on full pay up to the date of arrival at Calcutta. The Government is certainly not "going to spoil the ship for a penny-worth of tar;" and if the rest of the arrangements are carried out on the same scale (of which however we approve) there will be a neat little bill for Sir Richard Temple to settle in his next Budget.

COFFEE.

MOUNTAIN LIFE AND COFFEE CULTIVATION IN CEYLON.

By William Skeen, London: Edward Stanford. It is not often that an "increasing business" and the cultivation of the Muses are simultaneous and compatible. Yet we have an instance of such a phenomenon in this quarto of 180 pages, giving a description in verse, after the Scott school, of the Knuckles district, so named, from the resemblance of the projecting peaks of the mountainous range to the knuckles of the human hand. But this does not monopolise the poet's efforts, which embrace a goodly number of the prominent features of the island, from monsoons and [illegible] to roads, coolies, crops, and estate operations. To invest these with the colouring of romance, would tax a more [illegible] than the lyre than Mr. Skeen, who might, with all respect, have better given us the benefit of his impressions in prose. Save this remark it would be wrong to suppose that he is of the herd of common rhymesters. There is a fine easy flow in his verse, and a wealth of natural feeling that must have appeared to better advantage on a more promising theme. The typography, [illegible] intended by the author, who is also the Government printer, is a credit to the Ceylon press.—*British Trade Journal, August 1.*

IMPORTS AND THEIR VALUES FOR FIFTEEN YEARS.

The eighteenth "Statistical Abstract" for the United Kingdom, just published, amongst other items, gives the following figures anent the imports and values of coffee, from 1856 to 1870, inclusive:—

	Coffee.	
	lbs.	Value.
1870	170,901,864	£4,043,799
1869	175,416,232	4,027,605
1868	173,092,477	4,836,107
1867	137,729,718	4,362,760
1866	127,044,816	4,069,239
1865	137,997,451	4,040,887
1864	[illegible],327,842	3,[illegible],238
1863	117,354,217	4,134,330
1862	94,941,862	3,305,397
1861	82,832,435	2,632,779
1860	82,787,746	2,543,307
1859	65,333,030	1,955,702
1858	61,807,365	1,742,232
1857	58,692,729	1,797,415
1856	68,692,116	1,498,108

COFFEE IN ITALY.

Consul Brown, in his official report, while commenting on the trade of Genoa for the past year, observes:—"Italy is so closely bound, both commercially and politically, to France, that any great disturbance of the progress or prosperity of the greater country is sure to be severely felt by the less, and it was, therefore, to be foreseen that Italian commerce would suffer by the war, which has at the least temporarily crippled France. I see by the returns just published at Florence that the import and exports of the whole country have both fallen off considerably in 1870, as compared with the previous year. Genoa has not shared in this stagnation of trade, imports having increased slightly, and exports very considerably; and the shipping returns also show a corresponding increase in tonnage. The imports of coffee were 6,500 tons in 1870, against 6,000 tons in 1869. The consumption of Rio coffee has gradually but largely increased, owing chiefly to the amelioration in the qualities produced in Brazil. Washed Rio especially finds favour, and is gradually supplanting Porto Rico, which formerly was the quality of coffee most in favour; and it is to be foreseen that within a certain time these markets will almost give up the importation of Porto Rico coffee, unless this quality can be had at far lower rates, proportionately than at present. This explains that while Porto Rico coffee in the beginning of last season cost 73*s.*, the same quality later in the year was to be had at 65*s.* 6*d.*, with some stock less; while ordinary Rio coffee was in the beginning of 1870 at about 50*s.*, and rose gradually to about 55*s.* 6*d.*, with hardly any stock at the end of the year, and washed Rio rose from 58*s.* 6*d.* to 64*s.* 6*d.* A considerable re-export of coffee, principally Rio, took place from Genoa during the year for Leghorn, Naples, and Sicily, in consequence of Marseilles being unable to supply Southern Italy with the quantities usually sent there."

SALT AS A COFFEE MANURE.

The following query reaches us from a Dimboola planter:—"Can you tell me if salt is a good thing to mix with swamp muck, and if so, how to procure it in the cheapest market? Would lime be better? Excuse my troubling you with these questions, I know you are sometimes good enough to supply information to unfortunate coffee planters."

Our correspondent cannot be aware of the correspondence which passed between the Planters' Association and the Government on the question of a supply of salt as manure for use by the coffee planters. The manufacture and sale of salt, in the first instance, being a monopoly of the Government in Ceylon, it is impossible for the planters to obtain it at a rate which they could afford for manure, except a means be devised for completely destroying its fitness as an article of food. As yet the convenient and satisfactory means have not been forthcoming, and consequently Government cannot allow their mono-

polised article to be interfered with. We have no doubt that both, the cattle and cocoanuts, salt would form a valuable addition to the manure in use, and seeing that the maximum expense to Government for its collection or manufacture in any of the maritime provinces is only 8d. per hundred-weight,—ranging from 4½d. at Putlam and 5d. at Hambantotte and Trincomalie to 8d. at Jaffna,—it is clear that except for the tax, planters could afford to invest in considerable quantities for manuring purposes. But the monopoly prevents any person in the island collecting, manufacturing, or otherwise obtaining (under heavy penalties of fine and imprisonment) supply of this article, one of the first necessaries of life, except through the Government officials, at a charge from seven to sixteen times its intrinsic value, or 4s. 8d. per hundred-weight. The difference between the cost of collecting or manufacturing, and this amount, makes up an annual revenue to the Ceylon Government, over the whole island, of nearly £70,000. There can be no question that although the tax on salt is most repugnant to our Western notions of free-trade in indispensable necessaries of life, and especially in view of the extreme poverty of a section of the people affected, yet viewed as a plan for the realization of revenue which is indispensable, if good Government is to be maintained, the tax and the monopoly do not afford much room for practical objection. The taxation is indirect, the form best adapted to an oriental people, the article taxed is very abundant, and the price at which it is obtainable in the market very moderate. The few bushels of rice, the piece of cotton, and the little package of salt, afford almost the only means of securing contributions to the revenue from the average native. But it is no less true that the salt monopoly is the most odious of these three chief burdens on the people, and that it is perhaps the very first of our fiscal arrangements requiring modification. We trust the day will shortly arrive when the Legislature of Ceylon will see its way clear to the abolition of the tax, in view of an expansion of revenue in other directions, or a safe diminution in expenditure. The fact that the entire community, but especially the poorer classes, would be benefitted by the withdrawal of the tax, is of course the strongest of arguments which could be urged to any Chancellor of Exchequer; but in a producing colony, and especially in Ceylon where the wise principle has been recognised of introducing fertilizing articles for the soil, free of duty, it is a no less cogent argument to show that the salt monopoly as it stands, deprives the agriculturalist—be he coffee, or cocoanut planter, or rice cultivator—of the means of increasing the yield of produce from his land, and thereby affects the wealth, prosperity, and revenue of the island at large.

DURING the past fortnight we have had variable *weather*—better on the whole than for some time. Fine and showery by turns, but no continuance of one kind, nor any quantity of heavy rain. *August* has in fact been comparatively a dry month. June and July were exceptionally wet—especially the latter, during which more rain fell than for many years past. Indeed, I believe, more rain fell last July in most districts than in the first half of any year for the past ten years. It retarded the ripening of crops, however, which the late mixed sunshine and showers are pushing forward again. At one time it was thought that crops would be unusually early. And there was a little picking in July, and more in August. But again there is a lull—and that so early in the season is very ominous.

Crops will undoubtedly be very short, shorter in fact than many will yet allow themselves to believe. In some of the new districts, planters buoy themselves up with the hope that they are to be better than was at first expected. Many, however, will find to their sad experience, that these are only exceptional instances, and that new districts even have felt and suffered by the unusual climatic influence of this very extraordinary season.

The old crop will close with this month, so we need speculate no more on its probable out-turn. In thirty days from this date (1st September) it will be known for a certainty.

Rainfall this year has been unusual and extraordinary. Last year was one in which there were more rainy days than in the previous seven years. But there was probably less rainfall than in the average of years. And it was very varied in its fall. For instance, Kandy, which usually gets 90 to 100 inches had to put up with 69·66, which fell during 182 days. Colombo, which averages 60 to 70 inches, received as its portion 107·89 inches, spread over 157 days. Kegalla, a proverbially dry district, had 93·20 inches in 140 days. Rambodda, usually a very wet district, counting sometimes 160 inches, had last year only 104·19, which fell in 182 days (same number as Kandy). Nuwara Eliya had only 75·36 in 190 days. Dumbera, we regret, we cannot give; for although a record has been kept, we find it only registered for the last six months of the year, and in that time only 23·78 inches fell. It has certainly been a remarkable year, but does not all this show the necessity for not only the strictest accuracy in these returns, but for the Government insisting on their servants keeping and registering these returns, at every station where an Agent, Assistant Agent, or Road Officer resides!—*Ceylon Observer, 2nd Sept.* 1871.

DIBBLING AND PLANTING.

DEAR SIR,—Speaking of manure holes in my last, leads me to the study of a practice brought into vogue of late under the guise of economy, namely, dibbling and planting as it is called—one of the supposed ways in which coffee estates might be made to pay. A more ruinous mode of investing capital in the soil for the growth of coffee could hardly have been devised, unless its advocates were to point exultingly to the laws of nature and tell us to cast our seed broad-cast on the ground. It is this kind of planting that has suffered most severely during the late droughts, bringing the roots to the surface with a vengeance; so much so that a four-year-old tree might be knocked over with a walking stick.

To have an estate well holed and planted in the first instance is of the greatest importance to the well-doing of the plants. I know of *acres* that have succumbed to the dibbling system which, if it had been properly holed, would have been in existence still, the fact being that dibbling can only be done to advantage on very exceptional soils, and in exceptional weather; the same study of the soil is as necessary for the *introduction* of the *plant* as for the introduction of manure. The old West India style of holing and planting appears to me the safest to follow out as was followed by many in the infancy of coffee planting, including

Yours faithfully,

August 6th 1871. QUARTER CENTURY.

COFFEE LEAF DISEASE IN NILAMBE.

DEAR SIR,—Enclosed I send you a few coffee leaves, as specimens of a disease which is doing considerable damage to some estates in this district. On examination you will observe that the under part of the leaf is covered with a peculiar rust-coloured fungus, which adheres to the finger on pressure. The leaves sent represent the disease in its various stages. The effect on a tree so attacked is to deprive it of all foliage and leave it in very much the same state as coffee after a tremendous crop.

Unfortunately the disease is not peculiar to any field of coffee, and is steadily on the increase. Luxuriant and healthy trees suffer equally with those on exposed and wind-blown ridges.

Manuring has apparently no effect, as it is remarkable that the disease has attacked coffee, but recently dosed with cattle manure.

Men of experience in the district are much alarmed and fear that crop '72 and '73 will be short in consequence.—I am, dear Sir, yours faithfully, N. G. E. S.

NILAMBE, *August 23rd* 1871.

P.S.—Do the leaves resemble those forwarded to you from other districts some short time since?

[The leaves are, so far as we can judge, exactly the same as those sent to us from other districts, and it will be remembered that the general experience indicate no permanent injury to the coffee trees, although for the time the presence of the fungus may interfere with a vigorous appearance. Leaf disease of this nature has been observed at intervals during the last fifteen to twenty years in several districts, but it has never remained long, nor caused serious damage.—ED. C. O.]

PLANTERS' ASSOCIATION: THE SUPPLY OF LABOUR.

WE have been requested to publish the following correspondence:—

H. BYRDE, Esq., Secretary Planters' Association, Kandy.

SIR,—We are in receipt of your favour of the 7th instant, the contents of which received our best attention. We shall be happy to engage labourers on the following terms, provided orders are transmitted through the Planters' Association, as it would form some guarantee to us that such orders are *good* in every respect. The terms on which we offer to undertake to collect and ship labourers are as follows:—1st.—All expenses incurred *bona fide* for the labourers themselves to be refunded to us; these will consist of railway fare, diet money, cash advanced, housing, &c., and *ought not*, as a rule, to exceed Rs. 10 a head. 2ndly.—Passage money and boat hire to be paid by the Estates. 3rdly.—*For* our trouble we require a commission of 8 rupees for every adult male, 6 rupees for a female, and 5 rupees for a boy or girl of serviceable age. 4thly.—We require an advance of 10 rupees per head to accompany each order. We think the whole of the expenses under the first three heads may be recovered from the labourers. We also beg to state that in deference to Mr. A. F. McClure's opinion, we have reduced our rate of commission to what our long experience tells us is the lowest remunerative rate, and we hope you will not consider our terms excessive. The difficulties attending the work are many and great, but any remarks you may choose to make shall command our careful consideration.

We are, yours faithfully,
OLIVER & Co.

Negapatam, 23rd June 1871.

Messrs. Campbell and Co., Madura, Madras Presidency, have opened a Ceylon Agency for the supply to estates of labour, coast manures, produce, horses (Pegues), and other live stock. Their business is simply a commission one. They must be placed in funds to meet all outlay, and will charge a commission of 5 per cent. on all purchases effected, Rs. 3 for each cooly, man, woman, or child, landed in Colombo; 10 per cent. on all monies recovered from run-a-way Canganies, Chettiss, &c., &c., expenses being borne by constituents. Coolies cannot be bound in India to serve in Ceylon, they must be bound on arrival at Colombo, Rs. 5 should be forwarded for each cooly ordered, an advance of Rs. 3 will be made to each man, and the balance Rs. 2 will about cover travelling expenses to Tuticorin, from which port they will proceed by Steamer to Colombo. Messrs. Campbell and Co's commission of Rs. 3 per head, to be paid on date of coolies being handed over to the Colombo Agents or their constituents. As Messrs. Campbell and Co. are obliged to pay cash commission, per head, for every cooly secured, and monthly wages to a large staff, they must insist on prompt payments to date. They trust Ceylon Planters will be satisfied at getting their labour supplied at only Rs. 8 per head. Should any loss accrue to Messrs. Campbell and Co., they will not keep these terms, but will alter them from time to time as may be necessary; regular constituents will be informed of such change. Volunteers will be called for each constituent, should coolies not care to which "garden" they go, they will be sent to constituents in order of date of remittances for the supply of labour. Messrs. Campbell and Co. have now no Canganies on their own estates, and will never engage one for their constituents when avoidable. They look upon the tribe as a nuisance, the abolishment of which will reduce estate expenditure greatly. Messrs Campbell and Co. have agents in nearly all the towns of South India, and in many of the larger villages. They will draw their supply of labour chiefly from rural districts. As their agents are all men of substance and influence, and are engaged conditionally on securing men known to them, Messrs. Campbell and Co. trust that coolies sent over by them will be found respectable men; they cannot guarantee this, but their own interests will engender caution in this respect. So many parties have asked Messrs. Campbell and Co. to recover sums of money from run-a-way Canganies, Chettiss, and others, or to prosecute them, that they have engaged pleaders, detectives, and others to assist them in meeting the wishes of their constituents. Capt. G. A. Campbell served 8 years in the Madras Rural Police, was District Superintendent of Madura, Trichinopoly, and Tanjore, and trusts to be able to give constituents satisfaction in this respect. The firm guarantee to do their best in this and all other branches of their business, and no business, however small, will be neglected. With their intimate knowledge of South India, they trust to be useful to Ceylon Planters.

ADDRESS.—Messrs. Campbell and Co., Madura, for General Ceylon Agency; and Messrs. Campbell and Co., Dindigul, for Cheroots and cut Tobacco.

Madras Bankers,—Messrs Arbuthnot & Co.
Madura Bankers,—Madras Branch Bank.

TEA.

INDIAN TEA.

From the Delhi Gazette.

It is a curious fact that if tea is sent home privately from this country to England, it is greatly appreciated, and the people who taste it are all ready to become purchasers of 'Indian tea', but when they go into the market they cannot obtain anything like what has been sent home, and after a few vain efforts return to the old mixture. If you ask the grocers, they condemn Indian tea; at the best they say it is only fit to be mixed with the other sorts to give a flavour, being of itself too strong. In the interest of tea planters out here, we have done our best to ascertain the cause of so much of their tea remaining a drug in the market, and have come to the conclusion that they require a representative in the London market. There are vested interests in the China tea trade which form a very serious obstacle to the sufficient sale of Indian tea, and a raid on the London tea brokers and grocers must be made to give Indian tea a fair chance. It is impossible that with fair dealing India can remain behind China, which is now sending far more rubbish than good tea to England, and it is this rubbish which is flavoured with Indian tea that prevents Indian tea being sold in its place.

But we are sorry to say that a great deal of indifferent Indian tea also finds its way into the English market and injures the whole trade to an extent that may well be considered. Until the trade is set on a substantial footing, none but *bonâ fide* teas should be sent to England, and the market less forced than it is at present. In this way, with a few years judicious management, there would be an ample reward for the temporary self-denial. The planters must join hands and set to work with a will to obtain a fair market for their production in London itself, and take the pains to show the English public that for the same price they are paying for China rubbish flavoured with Indian tea they may obtain wholesome tea straightforward. Perhaps at the same time we think that the Duke of Argyll may well lend a helping hand with the Board of Trade and induce them to put a stop to the importation of the Chinese rubbish which has been proved to be coming every year more abundantly to London. The Indian office might in many ways encourage the sale of Indian tea, and probably the most practical way of bringing it before His Grace would be to send a waggon load of samples to Inveraray and Argyll Lodge, so that the Duke may realise how much capital is waiting a return, and of what vast importance the tea interests are, and also how much they are left in the cold by the Indian Government. But in Calcutta and Bombay more could be done, for it seems absurd that a single pound of Chinese tea should be consumed in either of the local capitals. Surely the whole of India should at least drink one or other kind of Indian tea, and are only prevented from doing so by prejudice which can and ought to be overcome. The price has perhaps something to do with it.

A great deal more tea would be consumed in India itself if the tea was sold cheaper, and surely it could be so, looking at the price for which it sells in London. Many more boxes would find their way to England from friends in India if the price were reduced. It seems absurd to pay three and four shillings a pound for tea, which is grown by your next-door-neighbour, when that is the price you could buy it at in England. And talking about boxes to England, why do not those enterprising firms in Calcutta and Bombay who make up boxes of hot pickles and curry-powder to send home, add to their selection a tin of Indian tea. It would be quite as much appreciated by people at home as tamarinds or mango fish roes, and probably serve a better purpose. Let the tea planters induce them to make the alteration and encourage the taste for Indian tea throughout England, for it only wants to be known to be thoroughly appreciated.

We hear that Captain Hidayut Ali is in the district for the purpose of recruiting Nepalese coolies for the Looshai expedition, and that finding them conveniently collected together in large batches under sirdars on the different tea gardens, he has commenced operations not far from Dooteriah. Surely this proceeding has not the sanction of Government.

All the Nepal knives in the bazaars have been bought up, and Brigadier-General Bourchier, C. B., from having been in this district, knows well the good stuff in the *kookrees* and the *coolies*, and is probably the author of this raid on our tea gardens.

THE force ordered out for the Looshai expedition having assumed formidable proportions, it seems that the Military authorities are now apprehensive of the difficulty of getting together a suitably strong coolie corps for the transport of baggage, and have cast longing eyes on the active and powerful hill coolies employed in this district. A more unlikely field for the required labour it would be difficult to name, unless very high wages be offered, and even then the tea planters are not likely to be beaten in the competition for the very limited supply of local labor—a supply very generally inadequate to the demand. Outsiders, as a rule, know very little of the watchful management and tact required to keep together an adequate gang of coolies for the several tea plantations in the district. Nepal is at present the principal source of the present supply of coolie labour for tea gardens and domestic employment. The Lepchas employed are few, and of Bhooteas the Planters can make nothing, as they are disinclined for regular work, preferring to earn their money by odd jobs of heavy work of a sufficiently remunerative character, to enable them to pass a large portion of their days in ease. We believe that the existing supply of coolie labour in the district will not bear much further strain, so far as tea plantations are concerned, and the long-wished-for Railway to Darjeeling, may not therefore, in this respect, prove an unmixed blessing for our tea planters, unless they follow the example of Australian colonists, and import large gangs of Chinamen.

MARKET REPORT.

LONDON, *7th September 1871.*

COFFEE.—The parcels offered yesterday were mostly sold at easier prices for pale and grey kinds, other sorts without spirit at about previous prices. 550 casks, 30 barrels, and 200 bags plantation Ceylon, all sold—triage, 50s. to 60s.; small to middling, 63s. to 74s.; good middling to good bold, 75s. to 84s.; peaberry, 82s. to 86s. 300 bags native Ceylon, all sold—small, 53s. 6d. to 54s. 6d.; fine ordinary bold, 58s. 2,000 bags Mangalore, one-half sold, at 59s. to 61s. 200 bags native Madras, 58s. 6d. 1,300 packages Naidcobatoor, mostly sold—triage, 56s. to 61s. 6d.; small to good middling bold, 63s. to 72s. 6d.; peaberry, 79s. to 80s. 6d.; and 400 bags of Guatemala, ordinary to good ordinary, 59s. 6d. to 60s. 6d.

TEA.—500 packages new season's teas sold steadily at previous prices; black leaf congou, 1s. 4½d. to 1s. 4½d.; gunpowder, 1s. 5½d. to 1s. 6½d. The deliveries in London estimated for the week ended September 1, were 1,687,452 lbs., which is an increase of 88,207 lbs., compared with the previous statement.

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

VOL. III.] BOMBAY, TUESDAY, 21st NOVEMBER 1871. [No. 4.

Agricultural Gazette of India.

CONTENTS.

ANSWERS TO CORRESPONDENTS.

"*About a month ago my Hurriallee grass seemed very healthy and promised a large return of hay. But, on going over the meadow, a few days ago, I was surprised and grieved to notice the condition of the crop, it was all but destroyed. Over a greater part of the ground only the mid-ribs of the grass remained, while the portion of the crop less injured, was covered with swarms of small caterpillars. What can I do to save the crop, and prevent the further depredation of the insects?*"

First, cut down all the grass that remains if not too much fouled by the insects it may be made into hay, but it must be removed from the ground immediately it is cut. also cut down all the standing mid-ribs, or they will spoil your next crop of hay. Immediately on the removal of the grass, roll the ground heavily. If the land is divided into small beds where a roller cannot be used, dust the ground at the rate of 400 lbs. per acre, with a mixture compound of equal parts by weight of slaked lime and ashes. If these precautions are taken, you need have no anxiety about the next crop.

"*I am in a district where no dry crops are grown, and have a large number of horses to provide with fodder: what can I do? Will it pay to buy hay at Rupees 45 a ton, and cart it a distance of 250 miles? or to buy straw at 15 Rupees a ton, and cart it a similar distance?*"

We certainly think that it will not pay to do either. Our advice to you is buy up 100 acres of growing paddy; cut it down just when the ear begins to form, and win it like hay for a couple of days in the hot sun. You should have a couple of tons per acre of excellent fodder, quite equal to the celebrated oat hay of Australia; while the cost will not exceed 15 Rupees a ton in your district.

"*Can the eggs of poultry be transmitted per post?*"

Yes; they can be packed in wool or cotton, and sent in a box by bangby post, but we fear they would not be of any value when they reached their destination.

"*Tell me where I can get a good Chaff-cutter for cutting both coarse and fine straw; and mention the probable price?*"

There are many manufacturers of Chaff-cutters in England; probably Messrs. Ransome Sims and Co., of Ipswich, or Messrs. Samuel Son and Co., of Banbury, could supply you; but there are many other makers equally trustworthy. These makers all turn out vertical-cutting machines; we prefer the machines with cylindrical cutters, made by Messrs. Ames and Co., of Boston, America. These machines are more easily worked, and do more work; they cost from 20 dollars to 50 dollars each, according to size.

"*I have a croquet-ground on which the grass is very yellow and sickly-looking, what manure can I apply? It must be something that will not stop our evening games, and must be free from smell.*"

Apply salt-petre at the rate of one pound to each 10 square yards of ground, after a shower of rain, or after the ground has been well-watered.

"*What is the Botanical name of the grain called Tenney, in the Madras Presidency?*"

Panicum Italicum.

"*What will a good farm cart cost?*"

The ordinary cart of the ryot can be made up for about 30 Rupees each, and large box carts (made of teak wood) at about 120 Rupees each.

"Can you inform this Department if the sugar-cane ever matures its seeds in the East Indies, and if so, what would be the probable cost per pound of the seed of one or more of the best varieties? I will be glad of definite information on that subject."

Horace Capron,

Commissioner, Department of Agriculture, Washington.

Note by Editor.—In Southern India the cane is always, we believe, propagated by cuttings. Some of our readers may perhaps be able to furnish a reply to Mr. Capron.—Ed. *A. G. of India.*

LETTERS TO THE EDITOR.

To the Editor of the
Agricultural Gazette of India.

Sir,—In your No. of 21st August is a description by Lt. Colonel Beddiam of a light plough made of wood and wrought iron, weighing only 70 lbs., and so simple as to be capable of being repaired or even made entirely in any village in this country that contains a blacksmith. From its description I was so struck by the evident suitability of the plough to farming here that I attempted to get one from a large mercantile firm in Bombay, who, I believe, import things of the kind, but am sorry to say they tell me they never heard of it, and can find no description of it in Ransomes and Sim's catalogue. Could you, or any of your readers, give me information as to where one is to be had.

Khandeish, 26th September 1871. Pear.

The ploughs referred to by our correspondent were supplied by the Government farm at Madras, and were made in the Implement Workshops attached to the Experimental Farm. They are fully described in the Farm Report for last year. We understand that Mr. Robertson has been obliged to raise the price to Rupees 16½ each, owing to an increase in the cost of the wood. Further improvements have been effected in the plough since the publication of the Report, a land-wheel has been substituted for the slade, thereby greatly reducing the draught; and the plough can, at an additional cost of Rs. 2-0-0, be fitted up with knives, as a drill-cultivator.—Ed. *A. G. of India.*

EGYPTIAN COTTON-GROWING.—N. W. P.

To the Editor of the
Agricultural Gazette of India.

Dear Sir,—In your issue of the 21st August 1871, I observe some remarks about the Egyptian system of growing cotton which I first experimented on last season on a small plot of ground only 1th of an acre, and as there appears some misconception as to the number of seeds used, and the implements required for cultivating on the Egyptian system, I hope you will permit me to explain that it was, when I tried wheat on this Egyptian system of furrows, that only a single seed was used, but where cotton is grown, some 4 or 5 seeds are dropped into each hole.

When the plants have attained a height of 3 or 4 inches, then, by the doctrine of selection or election, or by whatever name you may call it, only the strongest and most promising plant survives, but unfortunately for the Darwin theory, this selection does not rest with the plants, but with the cultivator, who pulls up the weakest plants.

This season, about 2 miles nearer Delhi than where I had my experiment last year, I had a field of exactly ½ of an acre, or six times as large as the one last year, and the cotton seed consumed in sowing this field was 3 seers 14 chittacks or 10¼ lbs. per acre, so anyone counting the number of seeds in one pound, will perceive that several are put into each hole.

As to the necessity of using peculiar instruments, I would observe, that no new instrument is required, but what is in daily use by the up-country native cultivators namely, a plough to scratch the ground from 3 to 4 inches deep. A "myrah" or "bailan" that is a flat board or roller to level and smooth the field after it is ploughed, and what is called a "jindrah" for throwing up the furrows which the people are all in the habit of using where there is well irrigation, so as to make small bunds and thus divide the fields into small square patches of 200 or 300 square feet each, to economize the water.

These patches are called by the natives "khyras," and I believe if this khyra system was by *law* enforced where there is canal irrigation, much unhealthiness from waste of water would be avoided, and a much larger area irrigated.

The only other instrument used is the "koorpah" for weeding which everyone knows, so you see that only the most simple and rude implements are required, and it was from a previous knowledge of our Indian methods of agriculture, that when I visited Egypt, I at once saw that there would be no difficulty in introducing the Egyptian system, for it did not necessitate the introduction of any new fangled instruments. All that is required is to prove to the natives that the Egyptian system will *pay* for the extra *care* necessary, and our object is accomplished.

My experiment this season, I am happy to say, promises to aid in bringing this about; for the field above referred to of ¾ of an acre, though not manured but irrigated, the natives say will produce 15 maund of "kapas"* (uncleaned cotton) or rather over 500 lbs. of clean cotton per acre.

In this neighbourhood, a zemindar was persuaded to try a small patch in the corner of his cotton field, and when I went to see it the other day, he said: "Look Sir I have got four plants for your one, and yet your system is "doogna suda" or twice as profitable" In the neighbourhood of Umballa I had some ten small patches tried *without* irrigation, and the result promises on the whole satisfactory, for the yield is expected to be from 200 to 300 lbs., per acre, but this is greatly owing to the favourable rains this season, though sometimes there was too much, and at other times too little rain. The lessons I have had heavy brought out by these experiments are 1st, avoid land liable to be flooded; 2nd, avoid having trees in the neighbourhood of the field, 3rd, have men to watch the field who have an interest in preserving it

Lastly, get water for irrigation if you can, and use manure also

Out of these ten fields two were completely submerged during the late severe floods, and three more were injured.

Where there are trees, the squirrels and parrots are a nuisance, and from neglect of a chowkidar, my best field near Umballa was trodden down and almost destroyed.

Trusting that the information now given will be of interest,

I remain, yours faithfully,

Umballa, 16th October 1871. T. LOGIN.

Note. We have since heard from Mr. Login that his experimental field at "Rai" (3) miles from Delhi) had up to the 24th of October yielded at the rate of 1[illegible] *lbs. of clean cotton* per acre. The field is exactly ¼ of an acre, and the result of the several pickings had been as follows:—

		in.	s.	ch.	
Collected on 22nd September	..	0	10	4	"kapas."
" 30th "	..	0	19	0	"
" 7th October	..	0	37	8	"
" 12th "	..	1	3	0	"
" 18th "	..	1	13	0	"
" 24th "	..	1	19	4	"
Total	..	5	24	0	448 lbs.

Therefore, as 0·75 : 1 :: 448 : 597 lbs. "kapas", and as 100 lbs. of "kapas" yield 31 lbs. of clean cotton and 69 lbs. of seed, the yield per acre up to the 24th ultimo had been 185 lbs. per acre.

EDITORIAL NOTES.

THE steam culture of sugar, says the *New Orleans Picayune* "seems to be a success, and the experiment on the Magnolia Plantation proves that the deep steam-ploughing has been peculiarly beneficial, as the cane has a dark green colour and thrifty look, though other plantations were suffering from the drought. The experimenter is very sanguine that the crop can be made, with steam cultivation, with one-third less mules, one third less labourers, and will give one-third more yield per acre than under the old system."

A PROCESS has been discovered for the prevention of decay in wood, which it may be desirable to lay before our readers. As the result of a five years, experience, a paint is recommended, which at the same time possesses the advantages of being impervious to water. It is composed of 50 parts of tar, 500 parts of fine white sand, 4 parts of linseed oil, one part of the red oxide of copper in its native state, and finally, one part of sulphuric acid. In order to manufacture the paint from these materials, the tar, chalk, sand, and oil, are first heated in an iron kettle; the oxide and acid are then added with caution. The mass is very carefully mixed, and applied while hot. When thoroughly dry, the paint is as hard as a stone.

THE *Maine Farmer* reminds its readers of the following "great truths" in agriculture:—"The farmer who starves his fields, is as unwise and improvident as he who starves his working cattle: in both cases he is diminishing the ability of a faithful servant to be useful to him. The farmer who obtains from a field, not properly fertilized, ten bushels of grain, when by manuring he might have obtained twenty, is selling his labour at half its value. He who does not give back to his fields as much as he takes from them, sells their fertility in his crops, and the fertility of the soil is the farmer's capital. The farmer who will keep these truths in view, and act in accordance with the rules they suggest, will find his compensation in the increasing products of his farm, in the augmentation of his wealth, and in the promotion of general prosperity."

THE following notes concerning the periods of gestation and incubation in animals will be interesting to some of our readers:—

		Shortest period.	Usual period.	Longest period.
		Days.	Days.	Days.
Mare		332	347	419
Cow		240	283	321
Ewe		146	154	161
Sow		109	115	143
Goat		150	158	163
Bitch		55	60	63
Cat		48	50	56
Turkey sitting on	Hen Eggs	17	24	28
	Duck do	24	27	30
	Turkey do	24	28	30
Hen sitting on	Duck do	26	30	34
	Hen do	19	21	24
Duck		28	30	32
Goose		27	30	33
Pigeon		16	18	20

"WHENEVER," says Mr. Mechi, "I use an artificial manure, I leave a portion of the field unmanured with it, and am thus enabled to judge by the crop if I am remunerated for the outlay. So various are the soils and conditions of each field, that such a comparative test becomes absolutely necessary, for where the whole field is manured, and no portion left undressed, no just conclusion can be arrived at. On this farm I have frequently applied bone-dust, superphosphate, blood manure, and other artificial manures, without the least increase of crop, while Peruvian guano, and especially our shed manure, are always profitable. As I know that on many farms such manures have been found very effective, there must be causes that render them inoperative on this soil. No doubt shed manure, resulting from animals fed with corn, cake, roots, and hay, malt-combs, and bran, contain all the elements for every crop. Possibly it may be that, having thus enough phosphates, the addition of more is not required or availed of by the plant. At all events, my case proves the necessity for comparative trials."

THE re-appearance of the potatoe disease in the British Isles, this year, is a serious misfortune. Whole acres in the west of England look black and desolate, instead of green and flourishing. Cobbett would have been charmed, could he have seen the blighted aspect of the "accursed root." The failure of the potatoe crop is a misfortune for England: it is a catastrophe for Ireland. There, we are told, the disease has already made frightful progress. Nine-tenths of the crops in Tipperary are already rotten, while no hope of saving the remainder is entertained. Since that terrible visitation which hastened the repeal of the corn laws, so great a calamity has not befallen Ireland as that which is now impending. There is, however, this consolation, that the cereal crops are reported to be generally abundant. The farmers themselves are not dissatisfied this year. Some of them at least pleasingly contrast the crops they are gathering now with the miserable harvest of 1870. Yet even under these otherwise favourable circumstances, the situation of the Irish people cannot fail to excite some measure

of alarm. Potatoes are to Ireland what rice is to India. When potatoes fail, disaster is inevitable. We hope, however, there is yet ground for believing that the reported ravages of the blight have been exggerated.

A LATE article in *Blackwood* contains some interesting information concerning the status of the farm labourer in Prussia :—

"Prussia has been the favourite theme for the eulogy of English economists, yet what does Mr. Howard tell us that he found near Cologne? 'The men, as in France and other parts of the Continent, sleep in the stable with their bullocks and horses. The wages to farm labourers are paid all in money, and are from 1 shilling 2 pence to 1 shilling 6 pence per day in summer, and 1 shilling to 1 shilling 3 pence in winter,' and this after a rise of 25 to 30 per cent. within the last twenty-five years, and amidst agricultural operations on a splendid scale of expenditure. On another Prussian farm, where beet is largely grown and additional quantities bought for the distillery, the wages throughout the year are 14 pence a day: in the summer months the working hours are from 5-30 A. M. to 8 P. M. The women get 10 pence a day: and in this district of Germany, 'there are a great number of small holdings.' In Prussian Silesia, life uses the wretched labourer still more cruelly. In winter he has 4 pence a day, the spring raises him to an additional penny, and he attains his climax in summer, when 7½ pence to 10 pence constitutes his share of the rewards of the harvest."

IN agriculture, as elsewhere, the steam engine, says the *Builder*, is gradually but certainly effecting a mighty revolution. "The grand leading features of the scientific cultivation of the country, the collection and store of our ample rain-supply, the arrangement of a good system of irrigation and of drainage, the general utilization of sewage, the defecation, banking, and stocking of our rivers, and the systematic provision of artificial methods for drying the in-gatherings of a wet August and September, have been little more than indicated, and that chiefly in our own columns. But the spreading use of the steam plough, the application of ingenious modes of economizing labour, the increased cleansing of land, the removal of weeds (even to the loss of the picturesque beauty of the scarlet chequering of our corn field by the poppy), the economy of time, no less than of cost, in ploughing, in sowing, in reaping, in stacking, and in thrashing, the extension of new and lucrative crops, as that of beet (which in France produced a return of £9,000,000 sterling in the year 1869), the economy of seed, and the selection of the better qualities of grain for reproduction, all these improvements are silently making way. A sum fully equal to the national expenditure might, within a few years, be freely added to the annual income of those who live on and by the land, by the free employment of available means."

WE are told by the *Gentleman's Magazine* concerning the late Prince Consort's farm, that "Her Majesty has a private sitting room adjoining the Manager's house, in which are hung pictures of the prize cattle, which have been bred on the royal farms. The pictures are by Herr Keyl, a very skilful farm-yard artist. "There are from eighty to a hundred shorthorns in the farm, and forty to fifty of them are in milk. The dairy produce is all required for the castle and the farm; and when the Court is at Balmoral, 120 lbs. of butter are made weekly. A dozen Alderneys are also kept as creamstainers, and the great object has always been to retain the whole badger colour, as there is a better foreign sale for them. This, however, was found impossible of attainment as long as the Alderneys were tethered head to head with the shorthorns, and kept the roan and flecked colours perpetually in their eye. They are imported at an average of from 20 to 25 guineas, and increase considerably in size with the rich grass, besides growing rather lighter in their colour. No forcing can make them more than half-fat, when their milking prime is over, and seldom more than £10 can be got for them at the butcher's. In the height of the grass, one or two of them have yielded 16 quarts per day."

THE *London Standard* publishes the following interesting notice of a Scotch farm near Dunmow from a correspondent :—

"I lately visited a Scotch tenant-farmer near Dunmow, and the story of his farm may throw some light on the claims of Irish tenants for improving land. His farm, in round numbers, consists of 400 acres, and his present rent is £4 per acre, or £1,600 per annum. His grandfather entered this farm, ninety years since, on a nineteen years' lease, at £90 per annum rent. At the end of every nineteen years, the landlord's agent went over the farm and re-valued it, and they have continued there ever since, never having had a longer term than nineteen years in the land, and at the end of every nineteen years being offered the farm at the fair value to let, with all improvements thereon. They now pay, as I have said, £1,600 per annum, and it is fully worth the money if it were out of the lease to-morrow. From time to time the landlord has advanced money for buildings, but the tenant has always paid high interest on such advances, besides doing the haulage for the buildings. When they first took the farm, it was wild heather land; now it is one of the finest farms in the Lothians. Both parties are contented. The owners have seen their rent rise from £90 to £1,600, and the tenants have raised their own condition from tenants of a wild farm at £90 to that of tenants of a fine farm at £1,600, and their capital has increased accordingly. They are as independent of the noble lord who owns the land as he is of them, and voted against him at the last election."

"THE necessity of cultivating small properties has been fully recognized by the Prussian Government by forced sales. I am not an admirer of this system, yet it is far better than the concentration of lands in the hands of the few, as in England. It leads to a greater distribution of wealth and enables the Government to call, with a greater show of justice, upon a larger number to defend the country when in danger. I very much doubt, had it not been for the existence of this system, whether the men of Germany would have fought so well as they did in the recent war. The battalions of our own Cromwell were mostly composed of men of a class of yeomen now almost unknown. They fought as men only fight who have something to fight for. In Prussia, by the law of 1850, the smallest occupier of peasant's land acquires the proprietorship at twenty years' purchase, the amount being paid to the landlord, not in money, but in rent debentures issued by the authority of the State, and bearing four per cent. interest and gradually redeemable by means of the one per cent. difference, which at compound interest extinguishes the principal in a little over forty-one years. The Prussian peasant has, however, two other options: he may pay less by one-tenth to the State Bank than the rent he formerly paid to his landlord, in which case the purchase debentures take fifty-six years to redeem: or he may, if he can raise the cash, compel his landlord to accept eighteen years' purchase money of the annual rent. By this means nearly 100,000 peasant proprietors have been created in Prussia. Rent debentures, to the extent of many millions, have been issued to the land-owners, and in less than eighteen years more than one-eighth of the debentures issued have been entirely redeemed and extinguished."—"*The Land Question*," *in the Contemporary Review.*

WE take from an Ipswich Journal the following interesting and detailed account of a farm-steading lately erected by Mr. Webb, Combs. Our contemporary says :—"The entire block of buildings, forms a square about 170 feet by 130 feet wide. A passage runs though the whole width of the block of buildings, with a door in each of the side walls, and, on passing along it, one

has the barn on one side, and the yards, the stables, the neat-houses, and piggeries, on the other. This main passage, and all those leading from it to the offices first enumerated, are floored with asphalte, and are as clean as the floor of any well-ordered manufactory. At one end of the main passage is a large square room, occupied by a pair of stones, a powerful chaff-cutter, and other machinery, to be used in preparing food for the numerous animals in the homestead. This room is, in fact, a perfect model of a farming mill, and any kind of machine may be added with the greatest ease, and driven from the one main shaft, with no more trouble than adding a band or pulley, while the room itself is far more capacious than many mills in which a considerable amount of business is done. Next to this room is a place for storing hay or clover ready for the chaff-cutters. One or two handy men, with a few bushels of coals, may here prepare a weeks' food for all the horses, bullocks, cows, and pigs in the homestead in the course of a few hours, and that too without regard to the weather, and at a time when their labour would be of scarcely any value elsewhere. The portable engine made by Mr. Wilkins, Orchard Works, Ipswich, needs only to be removed a short distance—not many times its own length—in order to be in a position to bring its power to bear upon the threshing machine in the barn, and by this concentration of the work upon a small space, a wonderful saving of time and fuel will be effected. Mr. Webb now forms nearly 500 acres of land in Combe—rather more than the usual proportion of which is pasture, and this block of buildings will be the homestead for nearly all this large breadth of land. Formerly, there would have been a dozen men threshing all winter, cow boys, bullock men, and pig feeders would have swarmed in the yards and buildings, but here a day, now and then with the portable engine and threshing machine, will suffice to prepare the crops for market, and as to feeding and watering the animals, an active man bustling through the corridors in stable and neat-house and piggery, will be able to do as much with the appliances here brought to his hand as half a dozen could when water had to be fetched from wells and ponds, very often at a considerable distance, and when the stores of food were here and there and everywhere, but where they were wanted. Would there were more farm-steadings of a like useful description throughout the country!"

LAMPERT, in his "Notes of a Journey in the north west neighbourhood of Pekin," published in the "Journal of the Royal Geological Society," says: While staying at this house I had abundant opportunities of examining the farming implements commonly used throughout the north of China, and amongst them I was much struck with the seed-sowing machine in general use. It would be difficult to describe this apparatus without the aid of a model. Their plough is a very simple contrivance. The share resembles a shovel, with a mould-board on the upper surface to turn off the soil: both are made of cast-iron, and very simply tied on the wooden frame of the plough. There is no coulter required, as the soil is so loose and friable that it would be unnecessary, and the farmer is satisfied with mere surface-ploughing. Sometimes one bullock is sufficient to draw the plough, sometimes a bullock and mule or donkey, or pony, are yoked together. The field, when ploughed, is harrowed with a very simple harrow, consisting of a triangular frame of wood having a number of sharp pointed iron prongs, about 8 inches in length, projecting on the underside. This harrow is usually yoked to a bullock; the driver, standing on the upper surface of the frame, gives it weight and hold to the ground. It is drawn over the ploughed field until the clods are broken into a tolerably even surface, and all the roots of the previous crop have been removed. Another harrow is now applied; it is made of strong wattles plaited together. The driver stands on this, while a bullock draws it over the field in all directions. These operations effectually pulverize and level the soil: but the Chinese farmer does not rest satisfied with this ploughing and harrowing, for the cultivation of the future crop, whatever this may be. As soon as it makes its appearance above ground, he commences working the soil about the growing crop with a hoe of a particular shape, and as he knows that the produce of the crop will be equivalent to the amount of labour bestowed on this work, he is unceasingly employed at it. One great result of this careful tillage is the remarkable absence of anything like a weed in their fields.

In districts remote from large towns or villages, the farmers are necessarily but badly supplied with materials for fertilizing the land; they are, consequently, economical of it, and carefully collect it on every opportunity. In land set apart for winter-wheat, small quantities of stable manure are harrowed into the soil in the first instance, and while the crop is growing, men may be seen with baskets suspended from their necks walking up and down the field, scattering in a powdered substance, as if they were feeding hungry poultry. This is the oil-cake made from the Chinese bean (dolichos), cotton-seed or cossamum, in process of pressing out the oil. The enormous production and consumption of these substances make them considerable articles of trade throughout China.

NEW GRANARIES—AMSTERDAM.

ALL new granaries have this as the fundamental principle upon which they are based, that in order to prevent heating and fermentation in large bodies of grain, it is needful that the air have free access to all parts of the mass. This is ordinarily obtained by turning and tossing the grain by manual labour; in fact, the corn is thrown through the air, instead of the latter being forced through the corn, as is done in Mr. Devaux's granaries.

The chief points in a good granary are:—

1.—Economy of space, as it is well known that the cost of a granary is almost directly proportional to its cube contents.

2. The substitution of machinery for manual labour. This involves necessary arrangements for receiving, delivering, distributing, and ventilating the grain.

3. Arrangements for storing the corn, so that a current of fresh air may be forced through the grain, thereby arresting at once the further progress of heating and fermentation, or the devastations of weevils. We may lastly, classify under the fourth head, the remaining conditions, that of preventing effectually the approach of rats and mice, and the reductions of fire to a minimum. These conditions are fulfilled, in our opinion, in the most perfect manner yet known by Mr. Devaux's system, a short description of which we will now give.

In size, the building itself occupies the least possible space, having no floors proper, but passages about 3 feet wide running all round and across it at the basement level, and at about the level of the top of the bins. The bins are rectangular chambers, from 4 feet to 10 feet square on plan, and from 40 feet to 60 feet high, according to what is required. The sides are formed of sheet iron, closely perforated with small holes, and stiffened with bar iron and tie rods. Running up the centre of each bin is a tube about 2 feet in diameter, also of perforated sheet-iron; and between the tube and the outer casing the grain is placed, which is consequently exposed to the air on two sides. Although the grain be in the worst possible condition, all that is necessary is to turn a moderate blast into the centre tube, when the air would push through the perforations right through the body of the grain, escaping ultimately through the perforations in the outer casing. A few hours of this treatment is quite sufficient to restore the worst samples to proper condition, although the heat may have previously generated to such an extent as to render it impossible to keep the hand in contact with the iron bins.

Having given the principle of construction, we now proceed to explain the means of receiving and distributing the grain, such as are adopted in the Trieste granary.

This granary was constructed for the Lombardo Venetian Railway Company, and is capable of storing 100,000 quarters of wheat. The Austrian military authorities, appreciating the advantages of the system, had large granaries erected in Verona and bakeries attached of sufficient extent to supply the Austrian army of 50,000 men with bread daily.

The granary is divided into three blocks, the space allowed in the centre one being 536,000 cubic feet, whilst the two side ones are each 695,000 cubic feet. The bins, 7 feet 3 inches square, by 42 feet high, with a centre tube 1 foot 9 inches in diameter, are grouped in fours and ranged in rows with a 3 feet passage between. The total number is 486. The grain is delivered in railway waggons for the accommodation of which there are nineteen docks, at a level of 22 feet above the bottom of the bins. Hoppers are placed between the docks, connected by

troughs to seven elevators, which raise the grain to a height of 8 feet above the top of the bins, and shoot it into distributing troughs, nine in number. By the action of 13-inch diameter archimedian screws, the grain is moved along the troughs, the screws being broken in by couplings at short intervals, so that in filling a near bin, the whole length of the screw is not required. Doors are placed in the bottom of the troughs, and shoots provided, each communicating to bins.

Following the course of the grain after having undergone the process of ventilation, we find that at the bottom of each bin a door is placed for the purpose of projecting the grain on to an endless band running beneath the floor. These bands or creepers, of which there are eighteen, carry it to another set of elevators, and by them it is lifted into a hopper placed a little above the delivery staging. Weighing machines are placed under these hoppers, and the remaining portion of the work, such as weighing the grain and tying the sacks, can be finished at leisure.

Such is a brief description of the process patented by Mr. Devaux, which, although doubtless imperfect in many of its details, nevertheless has shewn itself to be the only one of real benefit to the public.

We would strongly recommend anyone interested in the corn trade generally, whilst in London, to pay a visit to the granary lately erected on this system at Canada Wharf, Rotherhithe; although only about half the size of that at Trieste, it will show to satisfaction the various processes above described.

The practical success attendant on the processes already patented, gives clear evidence of the latent capabilities of the system, and we will not be surprised if we hear shortly that a step further has been taken towards improvement in this direction, doing away with that waste of power which at present exists to such an extent.—*The Farmer.*

IMPROVEMENT OF MADRAS AGRICULTURE.

We have much pleasure in publishing the orders of the Government of Madras, establishing Experimental Farms in various parts of that Presidency in connection with the Madras Farms, and we must congratulate that Government on the steps they have taken in abolishing the Committee under whose management the Madras Farms were formerly placed, an example we hope to see followed in other Presidencies. We have no faith in Committees and Honorary Secretaries as practical managers of agricultural details. These undertakings should be directed by professional men, men who have been trained in the college, and in the field in all matters relating to agriculture. It is true that the Madras Farms have, during the past two years, yielded most satisfactory results; but it is, we believe, universally admitted that this success was but the result of the gradual withdrawal of the Committee from the active management of the farms, the Committee during the past two years having confined their action almost exclusively to the financial affairs of the farms. In the order, under consideration, we find no reference to the Committee, an over-sight which, we hope to hear, has been rectified; for whatever opinion we may hold as to their fitness for directing agricultural operations, we cannot for a moment doubt their claim to the hearty thanks of the agriculturists of this country for their exertions in the cause of agricultural progress. In starting this extensive scheme for improving the agriculture of their Presidency, the Madras Government have, we think, done wisely in setting it free from all amateur influence. Mr. Robertson must stand or fall with this experiment; he will have many difficulties to contend with in overcoming the prejudices of native cultivators, and we think it highly desirable that his action should not be hampered by any interference on the part of those amateur farmers, who, in this country, crop up so plentifully when any scheme for agricultural improvement is about to be put into operation.

We do not despise amateur farming, but we object strongly to have a strictly professional matter, like agriculture, placed *under* the influence of amateurs; and we again congratulate the Government of Madras on the steps they have taken. Their order is as follows:—

The Government have recently reviewed the report of the Sydapet Farm Committee for 1869-70 and 1870-71, and have recorded their satisfaction with the very valuable results which have been attained under the skilful management of Mr. Robertson, the Superintendent.

They consider that the time has now come when the Government may, with confidence and advantage, extend their operations over a wider field, and afford to the agricultural interests of this Presidency those benefits and aids which are being extended to them in other parts of India.

Two courses are open to Government for this purpose. They might inaugurate operations on a large scale, and endeavour to exhibit the results of high farming over wide areas, with expensive machinery and establishments in a manner to attract the ryots; but they are confident that no real good would be derived from such a course, and that it would rather tend to discourage enterprise. They prefer the less ambitious method of establishing model farms of moderate size in several localities, with the view of demonstrating to the ryot the practicability of effecting sensible improvements by means quite within his reach.

The distinct objects at which the Government would aim may be epitomized as follows:—

(1.) To ascertain, by experiment, the proper use of rotation in crops in this country.
(2.) To introduce the system of root or green-crops in lieu of fallow, without artifical irrigation.
(3.) To introduce new crops.
(4.) To provide new kinds of seed and fresh seed for the crops now cultivated.
(5.) To make experiments in the use of water for the cultivation of crops now termed "dry" crops, and for raising grasses and other crops to be used as fodder.
(6.) To make experiments in the use of lime and other manures—mineral and animal.
(7.) To introduce new and improved implements of rural labour.
(8.) To improve the working cattle, sheep, horses, and other varieties of live-stock in the country.

It is evident from the foregoing that the scheme will be mainly one for the improvement of dry cultivation, and although wet cultivation is incidentally affected with reference to seed and implements of labour, still the main objects of inquiry and experiment are dry grains and unirrigated products, cotton, silk, tobacco, indigo, wool, &c. There can be little doubt that the cultivation of rice and of the sugar-cane is well practised, and a due economy of water is the only point which need attract attention at present in regard to it.

Regard being had to the number of objects in view, as above indicated, the Government consider that the proposed farms should be—

(1.) Of considerable area.
(2.) In different climates and at different elevations.
(3.) And placed conveniently with reference to water-supply, minerals, markets, and communications.

The area the Government consider should not be less than 200 acres for each farm, for although it may not at first be expedient to reclaim and cultivate more than 100 acres in each, still the additional cost of securing the larger area will be immaterial, and the command of means, for future expansion, is eminently desirable. The extent not immediately required for Government purposes, might probably be leased out at yearly rents, or might be used for pasture, growth of firewood, &c.

The localities which for the present approve themselves to Government, for the Experimental or Model Farms, are the districts of Bellary, Coimbatore, and Tinnevelly. Should it hereafter be deemed desirable to add a fourth farm, it might be placed in Salem Baramahal, or perhaps, by preference, in Ganjam, where it would be accessible to the people of Vizagapatam. These districts are comparatively backward, and inhabited in part by Oriyas, the least developed of the people of the plains, and in part by hill-tribes, almost destitute of any culture. But the districts have great capabilities; the climate is far more temperate than what prevails in the rest of the Presidency, and is probably specially suitable for the culture of indigo.

The primary object of the Bellary farm should be the cultivation of cotton, and the experimental use of varieties of seed; methods of culture, and mechanical processes; but a portion only of the area should be of the "black cotton soil," and the remainder should include other varieties of soil adapted for miscellaneous tillage. It will be an essential condition of selection that some portion of the area shall have means of irrigation either from a well-supplied tank or from reliable wells, or at least that water shall be attainable at such reasonable depth as to allow of wells being sunk and worked without extravagant expense.

In Coimbatore, the special objects should be silk-culture, the growth of tobacco and cotton, the breed of sheep, and perhaps the breed of horses, and, with these in view, attention will be directed in the selection of a site to the suitability of the soil for the cultivation of the mulberry and of tobacco, and to a command of water for raising green crops for the sustenance of live-stock. The farm should, by preference, be at a high elevation.

In Tinnevelly, the position will be selected partly, but not chiefly or exclusively, with reference to experimental cotton cultivation. The farm will be for general experimental cultivation, in which cotton will have a part, and in which regard will also be had to tobacco, senna, &c.

In selecting the sites for these farms, the Government do not desire that the requirement of first-rate quality of soil, of whatever category, should be insisted on. It will be sufficient that the land be of fair average quality, that its situation shall enjoy at least an average rain-fall as compared with the rest of the district, and that there shall be some partial water-supply, obtainable from a channel, a tank, or from wells.

A site will, of course, be selected conveniently placed as regards roads and existing or projected railways, and, if possible, within easy distance of a fair market for the farm-produce, including meat.

The neighbourhood of limestone of a quality fit to be burned for agricultural purposes, would be desirable but not indispensable. The experiments made at the Madras Farm in the use of lime are encouraging, except as to cost of preparation.

These District Experimental Farms will be placed in connection with the Sydapet Farm, and under the superior management of Mr. Robertson, in whom the Government possess an officer admirably fitted for the post, and who adds to his other acquirements, as a scientific and practical agriculturist, the great advantage of several years' experience of India, popularity with natives, and a thorough appreciation of the fact that the experiment, to be successful, must be economically conducted.

Mr. Robertson's present engagement expires on the 10th October 1871, and from that date his salary will be raised to Rupees 700 monthly, with horse allowance of Rupees 50 monthly, and his travelling expenses, when absent from the Presidency on duty. He will retain his residence on the Sydapet Farm, free of rent.

Mr. Robertson will come under the Uncovenanted Service Rules, regarding leave of absence and pension, and his service will date from the commencement of his original engagement. His duties will be to have the superior management of all the Government Farms which may be established now or hereafter. The Superintendents in immediate charge being his subordinates, to prescribe the course of operations, and to train the apprentices who may be placed under him for the superior charges. The Government have entire confidence in Mr. Robertson's competency for his important duty.

The general supervision of the agricultural experiment will be placed under the Board of Revenue, through whom Mr. Robertson will, in ordinary course, submit his reports and address Government.

But his reports on the individual district farms he will forward to the Board through the Collectors of the districts to which they refer, so as to keep those officers informed of the progress of the local experiment, and to allow them the opportunity of recording any remarks they may wish to make.

Mr. Robertson will understand that the Government expect him to consult fully with the Collectors as to all action in their respective districts.

The direct management of each farm will be conducted under Mr. Robertson's orders by a native Superintendent on a salary of Rupees 150 monthly, rising to a maximum of Rupees 250 by annual increments of Rupees 25.

To provide the necessary agency, the Government resolve to establish four native apprenticeships at once, and to attach to them salaries of Rupees 40 monthly, with lodging on the Sydapet Farm, and to instruct the Collectors of Bellary, Coimbatore, and Tinnevelly, to select for them from the ryot-class of their respective districts, or from some class connected with the land, each young man, of age between 18 and 20 years, of good constitution, and possessing a colloquial knowledge of English, who may be willing to enter into the engagement. The posts of Farm Superintendent will be given to the best qualified apprentices at the end of 3 years' training.

The Collectors will also proceed to select in their respective districts one or more blocks of land, either waste or cultivated, extending approximately to 200 acres, and fulfilling the conditions above specified to serve as an experimental farm.

The land being indicated, Mr. Robertson will be deputed to visit the site and report upon it. He will submit to Government through the Board of Revenue—

(I.) A rough estimate of the cost of establishing an experimental farm of the dimensions prescribed, contemplating, in the first instance, the cultivation of 100 acres.

(II.) A general estimate of an approximate character of the probable permanent charge which will be incurred for establishments, including his own salary, at the Government Farm at Sydapet, and at the three provincial farms, making provision for four students at the Sydapet Farm.

(III.) Proposals for the reclamation and management of the three projected farms, until they can be placed in charge of their permanent Native Superintendents. It may be presumed that the requisite buildings could not be raised, and the necessary improvements perfected in less than two years from the present time.

As to the source whence the funds for this agricultural experiment shall be derived, the Government are of opinion that the surplus Cattle Trespass or Pound Fund furnishes a suitable and sufficient provision.

Act I. of 1871 provides that this "surplus shall be applied, "under the orders of the local Government, to the construction "and repair of roads and bridges and to other purposes of public "utility;" and the Government consider that the object in question is a most appropriate purpose on which to employ part of the funds.

The Budget for the current year estimates that an unapplied balance of Pound Funds of Rs. 77,000 will remain at its close, after allowing for a liberal allotment for roads and bridges, and the demands on the balance for the experimental farms cannot possibly be large for the remainder of this year. The contribution from this source for roads, &c., in aid of Local Funds will not hereafter need to be on so liberal a scale as hitherto, and the Government do not doubt that ample means will be available for [illegible] present scheme.

They commit it to Mr. Robertson and to the Board of Revenue and district officers, with the confident anticipation that no effort will be spared to ensure success, and in full hope of valuable results being attained for the improvement of the country.

(True Extract.)
(Signed) W. Hunter,
Secretary to Government.

November 1st, 1871.

AGRICULTURAL STOCK—INDIA.

BREEDING HORSES IN THE DECCAN.

DEAR SIR,—In your paper of the 4th instant, I see an article from the *Madras Times* on breeding horses, on the Australian principle, in the Deccan. Considering the enormous price at which the stud department put their horses into the tanks, the enterprising gentlemen will, I have no doubt, meet with the good wishes of the Indian Government, as well as of private individuals, if they can manage to breed a good description of horse for less, or a better animal for the same price, at which walers can now be obtained in Calcutta. I hope they may succeed; that they will beat the stud department there can be little doubt, but they must beat their brother-settlers before they can call it a complete success. By the latest accounts from Australia, settlers have to drive their horses great distances to market before they can get £8 or £9 a head for them; and taking their passage, &c., to India into consideration, I believe they can be sold to Government for about Rs. 400 each. Settlers who breed sheep and cattle in Australia must have a certain number of horses on their runs, and the surplus ones that they could dispose of every year may be said to cost them actually nothing, if sold on their runs and unbroken, which is the best way to bring them to India, as it is very often the rough handling they receive before embarkation, under the name of breaking, together with their being mounted too soon, that turns them into confirmed buck-jumpers. I understand that horse-breeding in Australia does not pay nearly so well as sheep and cattle. I believe it is sheep first, cattle second, and horses lowest of all. Now, what is to be saved by breeding in India? I suppose the passage, about £20, and stable expenses at the ports of embarkation and disembarkation—the latter only if the Government or people wanting horses send to the Deccan for them. The gentlemen deputed to "examine the country, and see if there was anything to prevent horse-breeding on the Australian principle," has, I have no doubt, gone well into the matter; but it surprises me to hear that horses can be kept out in the sun and rain for eight months of the year without any attendance or other food than the grass which they may pick upon the Rumna. They might live, but would they be in the condition that young stock and brood mares ought to be in? It is well-known that for the first six weeks after the rains commence, there is no nourishment in the grass, and it therefore is more likely to cause disease than to be a benefit. I therefore think he must add considerably to his "four months' store of grass and food;" but even grass and food for four months of the year make 20 months' feeding for every five-years-old which could not come to one farthing less than Rs. 6 per mensem, or a total of Rs. 120: this is for hay and gram alone, the latter at 30 seers for the rupee, and allowing each animal 2 seers a day. I don't know the description of country, 6,000 acres of which has been, or is to be, granted for the purpose; but many of the Rumnas in the Deccan have no trees or shelter of any kind; in which case, until they were planted and grown up, sheds would have to be built, besides the expense that would be incurred in supplying the stock with fodder, water, &c., during the four months before-mentioned. The loss of foals, not to say colts, and even horses, by wild beasts, ought also to be taken into consideration in comparison with a country like Australia, where the only animal to fear is the native dog, about the size of a jackal. If all these little matters, and many more that could be mentioned, do not run away with the £20 passage-money from Australia to Calcutta, I, for one, would be very glad to see the idea carried out.

SECRETEL.

AGRICULTURE IN BENGAL.

PURNEAH.

To the Editor of the Indian Daily News.

SIR,—As you have often invited the opinions of your correspondents on the subject of agriculture, and as I find none inclined has not been responded to, I will take it on myself to make some observations on the subject.

Before I proceed, I will here remark that I have for many years made experiments on a small scale, but on testing those experiments on a larger farm, I have invariably found that the results did not correspond with my expectations. A great many obstacles present themselves in practical farming which are not met with when tried on a small scale. I would have to occupy a great deal of your space if I were to enter into details, and will, in consequence, be compelled to make my remarks as concise as possible. The subject proposed is whether drill sowings are not better than broad-cast sowings, and whether they could not be generally introduced among the Indian cultivators? My reply to the first is, that drill sowings would not be more profitable than broad-cast sowings in the present state of Indian agriculture, and the retrogressive policy of the Indian Government in agricultural matters; and, 2ndly, that the cultivators would not adopt them. The whole subject hinges on whether it will or will not pay best; and Indian agriculturallists, I mean the ryots, have voted against it. And, when I further inform you that I consider the native cultivator is (with all his ignorance and superstition) in a better position to give a sound opinion on the subject than Europeans can do. You will perceive that my opinion is decidedly on their side; you must not suppose that I have adopted this opinion lightly or in haste. I have had my years of garden experiments and years of prejudices and contempt for the Indian agriculturist, and though I can still have enthusiasm left to labour for great improvement, yet this has all been toned down by experience. There is no use in talking of improving Indian agriculture. The Indian Government must be enlightened; they must come to know their duty, and how to act with justice and impartiality (in place of frittering away their time) in exciting class prejudices, and getting up Philanthropic Baboo shows to be exhibited to an ignorant and credulous public in Europe. I have already diverged from the subject I set out with, but this can scarcely be helped, for it seems childish to be discussing the subject of improvement when improvements are practically prohibited; for how can we expect the cultivator to expend money on improvements when he knows his doing anything of the kind would subject him to rack-renting, extortion, and oppression. Now with this preface, I will come to the subject, and say that just now broad-cast sowings pay best with some crops, and sowing in lines pay best in other crops. Tobacco is sown in lines. Agoony paddy is transplanted at regular distances. Indian corn would answer well if sown in lines. The subject as to whether indigo would pay best, if sown broad-cast or by drill ploughs, has been decided in favour of broad-cast sowings in this district, though I am in favour of drill sowings which are in use in the zillahs west of these crops that are irrigated, such as onions, are sown in lines. The Buddie paddy reaped in August is sown broad-cast, and in consequence of the many weedings and rackings it has to receive, it would not pay to add the expense of drill-ploughing.

Wheat, oats, and barley are sown broad-cast; a little extra seed is cast to make up for bad seed, or to allow plants to be weeded out, if the crop is too vigorous.

I must here inform you that it is not good to have the land too highly manured for wheat, in which case there will be all straw and very little wheat.

In consequence of the oppression and rack-renting, the system of agriculture carried on here is a very improvident one; one-tenth of the land, under a more improved system, would yield as much as this zillah does at present. Providence is looked to for a good crop; the country is ripped up, and seed sown over 50 or 100 acres of land, by a single cultivator with two or three ploughs, and then it is left to take its chance. He has not the means to manure or irrigate his lands; nor has he the heart to invest money in it. It would take a large capital to work so large a farm, yet the owner has not a farthing to bless himself; he borrows money to buy his plough bullocks from a mahajun at 33 to 75 per cent. interest, and pledges all he has, and a portion of the crop. Providence does not send the looked-for rain or sunshine, and the wretched cultivator does not reap sufficient to pay his rents, and the interest on this money borrowed under a more favourable system. A cultivator, with much larger means, would be content with 5 or 10 acres of land, and as there is always water to be had in this district at a depth varying from 10 to 16 feet from the surface, he would irrigate his fields from pucka wells or tanks, he would not require so much manure for his small farm as is necessary for the wild wastes, he now cultivates his well-kept farm of one-tenth its former size, he would not require so many men to weed it as it does now, which is never thoroughly weeded, and he would find that nearly every season would more than compete with the long-wished-for season he now looks out for, when timely rain is considered a God-send.

Providence has given both water and sunshine. The last Government or its servants, the zemindars, cannot touch; but the sea of water that flows on at 16 feet from the surface must not be touched, else the minions of the State will pounce on the unfortunate wretch, and squeeze the last drop of juice out of him.

I must here remark that one great advantage drill-sowing has over broad-cast sowing is, that it can be sown at the depth required, while broad-cast sowings may fall on the surface, and seed be wasted; but a general introduction of any improvements in agriculture must be preceded by an improvement in the land tenure, &c. If we wish to introduce the *Chinese Garden Cultivation* into India, we must introduce their land tenure also, which is nearly identical with the Indian land tenure abolished in 1793, viz., that the land belongs to the cultivator as long as he can cultivate it, and as much as he himself can cultivate, no other class of people in the country can deprive him of his farm, nor retain any mortgage on the same. If the cultivator is not able to cultivate his lands, he must give up all, or a portion of it, to those who can. Government claim one-fifth of the produce of the soil as their share. Now, Sir, let us suppose for a moment that if Government were to introduce such a system into this zillah, and, fixed the land assessment at an average of 8 annas a biggah (or 2 Rs. 8 annas a biggah for the total produce), why the zillah would give double or treble its present revenue at once, and relieve agriculture. We could, if settlements were made for thirty years, then expect to see improvements. However, there is one thing I must add here, viz., that if Government did take over the land into their own management, I am certain they would make the blunder of allowing a small number of individuals to set up as small zemindars, who would submit the land, and perpetuate the present evils let. It were better to perpetuate the present system than to introduce a worse one. If agriculture is to be improved, no one must stand between the cultivator of Government. Government must receive the rents directly into their own hands, and see that no one monopolises more land than he can cultivate satisfactorily. The land should belong (as it did) to the public at large. Government are the trustees, and the cultivators farm as much as he can find capital to work; he should hold it in perpetuity, if he can cultivate satisfactorily, and pays the pergunnah rate fixed periodically.

When all this is done, and no class, caste, or creed distinctions are made, you will find the natives will just keep a chalk ahead of the Europeans, who wish to set up as agriculturists in India. I do not mean to say that they will turn out as good farms, but they will turn out more profitable ones.

On a highly-cultivated farm, drill sowings has its advantages, but under its present system it has no advantages, and would be more expensive than broad-cast sowings.

I think you will not be surprised at the superstition of the natives in agriculture, as well as their great dependence on Providence, when I assure you that they have good cause for it, for be they ever so industrious, if the winds are not favourable, they will not have a good crop. To make myself fully understood, I must here inform you that the prevailing winds have a great deal to do with the agricultural out-turn in this district. Every good native agriculturist well knows that if the east wind prevails in October, November, and December, when his Agoony paddy is coming into blossom, and the grain is forming on the ears, that the paddy crop will be a total failure; the east wind is favourable for the growth of the plant, but bad for the formation of the grain. If the east wind prevails during the time, when wheat, oats, or barley are in ear, there will be a short crop or a total failure. On the contrary, if the east winds prevail before the plant comes into blossom, and if the west wind prevails while it is in blossom, we shall have a first-rate crop of grain. The west winds are necessary to bring the Agoony paddy, wheat, &c., into full ear. However, should the west wind set in in October, and last until April, I should pronounce it a bad season, for though it is favourable to the Agoony paddy, yet it evaporates the moisture of the ground so quickly, that the crops sown, during the prevalence of those winds, suffer for want of moisture, and are consequently stunted in their growth; the consequence will be a short crop in the good lands, and a failure in sandy soil, a heavy shower or two during the prevalence of the west winds restore the moisture to the soil, and a good crop will be obtained. When I further inform you that the west winds generally prevail from October to May, you will perceive how necessary it is to introduce irrigation into our agriculture, but for the prevalence of the east winds, I see no remedy just now. Judicious manuring might counteract the effects of this last wind. I never could get cotton to ripen during the prevalence of the east winds. Insects of all kinds increase, and infest the fields during the prevalence of this wind.

On the contrary, cholera prevails during the severe west wind. I mean, commits fearful ravages; it travels from east to west against the wind, and crawls along the hollows and beds of rivers, sheep die or become infested with vermin, which devours whole herds during the west winds. A kind of insect infests the dry fields which devour the young plants during the west winds; the insects die when the wind changes. Each of these winds bring scourges, which cause serious inconvenience if they prevail for any great length of time. The crops that ripen in May, June, July, and August, such as Buddie paddy, Indian corn, &c., on the contrary, thrive during the east winds

and suffer in the sandy soil from the west winds. I have only drawn an outline of the picture presented by the prevalence of the winds, which will enable you to form an idea of the powerful agencies that are at work to compel these people to depend on more than human aid in their agricultural aspirations.

From all this you will perceive how necessary it is for the cultivator to make use of extra seed to meet the vicissitudes of the season, even if drill sowings were used. This precaution should be taken, and it is only in case the Chinese plan of manuring the grown plant with liquid manure that drill sowings in lines would be advantageous, which would expedite the manuring.

The agricultural prospects of improvements in this country would occupy so large a space, that I can only attempt to touch on the subject very superficially.

We have had heavy rain during the whole of this month, and there is no prospect of clearing up. Most of the compounds have a great deal of water lodging in the hollows, which must cause a good deal of sickness when it begins to dry up. I am told the Municipal Commissioners are going to drain the southern part of the station. This drainage is very necessary. For about a square mile of the station has the rain-water lodged in the hollows. Without any outlet for the same, this portion of the station has been built during the last seven or eight years.
—Yours, &c., X.

Purneah, September 8th, 1871.

(From the Hindoo Patriot.)

As the zemindars are now roundly charged by the Lieutenant-Governor and the press with want of public spirit, we have much pleasure in reproducing from the *Government Gazette* the following list of Public Works executed last year in this Province, at private expense, with the names of the donors, excluding all works below the sum of Rs. 300 :—

Names of the individuals by whom constructed.	Description of work.	Cost.
Shah, Baboo Bunwareeloll, Roy Bahadoor, of Chuprah	A travellers' serai	1,50,000 0 0
Baboo Bunwareeloll, of Durbhungah	Re-digging Elliot's tank	13,300 0 0
Deeraj Sahoy, of Hutwa	A tank	2,125 0 0
Gungadhur Pershad Narain Sing, of Chyampore	ditto	2,000 0 0
Banojee Bhagut Byragee, of Bud lootolah	ditto	600 0 0
Sheebs Sahoo	ditto	1,300 0 0
Ramjoy Roy	ditto	1,500 0 0
Kalichurn Mundle	ditto	1,000 0 0
Annutololl Mundle	ditto	700 0 0
Nundo Gopal Banerjee	ditto	500 0 0
Madhab Mundle	ditto	400 0 0
Tejchunder Chungdar	ditto	3,000 0 0
Atun Sheik	ditto	1,000 0 0
Sonat [illegible]	ditto	450 0 0
Shamoo Sahoo	Cleaned a tank and made a masonry ghat	650 0 0
Ram Chunder Acharjee	Metalled road	500 0 0
Tumeeruddin, Munshee	Repaired kutcha road about a mile and constructing a bridge	300 0 0
Messrs. Watson and Co	An embankment	1,500 0 0
Ditto	ditto	1,280 0 0
Hurronaram Chuckerbutty	A tank	400 0 0
Manickram Bera	ditto	500 0 0
Hayat Khan Bhuia	ditto	450 0 0
Ramgutty Shah	ditto	450 0 0
Kuchamath Mahuta, of Sydabad	A large tank	620 0 0
Gour Chundra Shaha, of Nobogram	ditto	415 0 0
Rameshur Mundle, of Dabidaspore	A kutcha road with a pucka bridge	400 0 0
Jagobundhoo Roy, of Kanchutollah	A road from Kanchutollah to Dhohan, 2 miles long with 2 masonry bridges on it	300 0 0
Ranee Brojo Sundoree	ditto	1,500 0 0
Muffar Gain	ditto	1,000 0 0
Dohee Sirdar	ditto	900 0 0
Kally Mohun	ditto	900 0 0
Santo Pramanick	ditto	875 0 0
Azimut Pramanick	ditto	850 0 0
Gazee Pramanick	ditto	825 0 0
Rahumut Pramanick	ditto	800 0 0
Mohun Shahi	ditto	800 0 0
Shumbhoonath Tagore	ditto	800 0 0
Kadar Pramanick	ditto	775 0 0
Shadoo Fukere	ditto	750 0 0
Shadoo Mundle	ditto	700 0 0
Kubeer Meeah Khundokur	ditto	700 0 0
Juggomohun Sircar	ditto	700 0 0
Joykisto Nurosoondeer	ditto	650 0 0
Brookisto Shaha	ditto	600 0 0
Alaton Shaha	ditto	600 0 0
Modhai Pramanick	ditto	500 0 0
Doyal Chand Shaha	ditto	358 0 0
Ranee Sharno Moyee	A pucka well	350 0 0
Ditto	A tank	350 0 0
Nya Mea	ditto	300 0 0

Of course the above list gives but a faint notion of the amount of private charity of the zemindars and other wealthy native gentlemen of Bengal. There is no record of the thousands and hundreds of thousands of rupees subscribed for schools, dispensaries, and hospitals, and numerous other public objects started every month in the capital and in the towns or cities in the interior, not to mention the religious and charitable institutions and ceremonies, which are peculiar to the genius of the people, and which are conducted with an unobtrusiveness, which a nation, looking to newspaper advertisements as the chronicles of charitable deeds, cannot appreciate.

PROPOSAL FOR AN AGRICULTURAL EXHIBITION IN 1873 IN BENGAL.

From the Secretary to the Agricultural and Horticultural Society of India; to the Secretary to the Government of Bengal, dated Metcalfe Hall, 18th July 1871.

Sir,—At the last monthly general meeting of the Agricultural and Horticultural Society, held on the 15th June, the subject of agricultural exhibitions was discussed, in connection with certain interesting details that were then submitted regarding the last annual show of the Royal Agricultural Society of England; and a resolution was passed to the effect that a communication be addressed to the Government of Bengal. It will be remembered that the first and, as yet, the only exhibition of an agricultural character that has been held in Calcutta, under Government auspices, took place in January 1864. It being important to know if any and what progress has been made in the different branches of agriculture during the last 7 years, and the facilities for sending specimens from various parts of the country having considerably increased in that time, I am directed by the Council respectfully to submit to His Honor the Lieutenant-Governor, the desirability of holding another exhibition in January 1873, on such plan of operation as His Honor may consider best, and to tender the aid of the Society in assisting to carry out the details of the scheme. The Council would, however, venture to suggest that prize lists should be previously prepared by a Committee specially appointed for the purpose, and that special encouragement should be held out to the rural classes for growing successfully articles which require special encouragement. The Council suggest that for the exhibition in the early part of 1873, should His Honor approve of the proposal, the expenses thereof might be included in the next budget. The Council further submit that the result of this exhibition will probably prove of special value to the recently organized department of agriculture, as well as to all interested in the development of the agricultural resources of the country.

From R. H. Wilson, Esq., Officiating Under-Secretary to the Government of Bengal; to the Secretary to the Agricultural and Horticultural Society of India, No. 2195, dated Fort William, the 26th July 1871.

Sir,—I am directed to acknowledge the receipt of your letter dated the 13th instant, suggesting that another agricultural exhibition be held in January 1873, and in reply to state that, before passing final orders on the proposal, the Lieutenant-Governor will be glad to be informed if the Society have reason to believe that practical benefits have resulted from the last exhibition in the way of the improvement of agriculture; and if so, I am to beg that you will be so good as to specify any that have come to the knowledge of the Society.

From the Secretary to the Agricultural and Horticultural Society of India; to the Secretary to the Government of Bengal, dated Metcalfe Hall, 10th August 1871.

Sir,—I am directed by the Council of the Agricultural and Horticultural Society to acknowledge the receipt of your letter, No. 2195 of the 26th ultimo, and to offer the following observations. The Council are of opinion that the exhibition of January 1864 had the desired effect of enlisting the interest of the native zemindars, and of the community in general, in the objects which the exhibition was intended to promote. One great practical effect of the exhibition was that it enabled the Government and the community to form a comparative idea of the growth of the different articles, and the breed of live-stock in different parts of the country, and the consequent increased competition on the part of many to avail themselves of the improvement in the specimens exhibited by others. It is only by public exhibition that information as to the state of agriculture in the different parts of the country can be practically known, and the progress made accurately ascertained. It is improbable that all the benefits derivable from periodical exhibitions can be realized by such spasmodic, unsustained, and interrupted efforts as were made in 1864-65. This exhibition, it will be remembered, was followed in the succeeding year by local exhibitions in various districts of Bengal. These local exhibitions were more or less successful, as a stimulus to those interested in agricultural pursuits, and thus, in their turn, subserved the object in view. It was originally contemplated that another central

exhibition should be held in Calcutta in a reasonable period after [illegible] to see what improvement in agricultural [illegible] and rearing of stock, in the manufacture and use of agricultural machinery and implements had taken place, since the first central exhibition of 1863. Owing, however, to the famine in Orissa and subsequent distress in various parts of Bengal, any good effects which might have resulted from the institution of these exhibitions have been arrested in the hard struggle for life during the period referred to; and for these reasons the Council of the Society are not in a position to state what specific advantages actually have accrued.

As regards machinery, however, I am directed to bring to the notice of His Honor the Lieutenant-Governor the opinion of one of the largest exhibitors of machinery at the exhibition of January 1864, which is couched in the following terms:—"If such exhibition as that held at Allipore in 1864 had been steadily continued, it is our firm conviction the results would have shown themselves ere this." It could scarcely be expected, even by the most sanguine, that a single initiatory central exhibition, followed by a few local shows in the succeeding year, would produce any perceptible lasting benefits. In support of this view, the Council would draw attention to the case of agricultural exhibitions in England, where it has required a succession of annual shows to achieve some of the objects contemplated by the promoters. It is a question whether at the present day the Royal Agricultural Society could point out such an extent of improvement in the various departments of agriculture as might have been anticipated after the experience and encouragement of more than a quarter of a century. If therefore, backed by the great intelligence, skill, and capital of a large section of the community, the state of agriculture in England leaves still great room for improvement, it is but fair to assume that before any perceptible improvement can be looked for in the agriculture of Bengal, persevering and well-sustained efforts for its improvement must be made by the employment of means successfully availed of in England by district and central exhibitions of agricultural produce, stock, machinery, and implements.

From the Officiating Secretary to the Government of Bengal, in the Judicial and Political Departments; to the Secretary to the Agricultural and Horticultural Society, No. 597, dated Yacht Rhotas, Gowhatty, the 27th August 1871.

SIR,—I am directed to acknowledge the receipt of your letter dated the 10th instant, communicating the opinion of the Society in regard to the benefits which have resulted from the agricultural exhibition of 1864, in the way of improvement of agriculture, and with reference to your previous communication of the 13th ultimo, I am to state for the information of the Society that, with the census and cess work in hand, the Lieutenant-Governor is not prepared to pledge himself to an early agricultural exhibition. His Honor is of opinion that without holding the proposed exhibition, the agricultural interest of the country may perhaps be improved in a humbler manner meanwhile.

SUGAR FROM BEET.

(From the Deccan Herald.)

WE have noticed the large establishment in Germany for the manufacture of sugar from beet roots, and the great success which has attended this experiment. Mr. Henry Bernard of Lille has just published a pamphlet on "La question des sucers" dealing with points connected with the drawback convention. There are great varieties of opinion with regard to what kind of produce yields the most saccharine strength. Mr. Bernard appears to attach more importance to the Cologne experiments than they deserve, for it is evident that they afford no clue to the yields given by beet sugar, as only 17 per cent. of that sugar was used in the experiment in the first class, 24 per cent. on the 2nd class, 19 per cent. on the 3rd class, and none on the 4th class. It is notorious that the French export refiners who have found out how to trick the provisions of the convention use beet root almost entirely. To those employed in the manufacture of sugar it is well-known that beet sugar gives a much larger yield in refining than cane sugar, and it therefore seems folly to mix an average of only 24 per cent. of beet sugar, and to take an average which is useless, if only beet sugar is used. Various are the opinions as to how sugar is to be tested as to strength, and with what duties it should be charged in France at present; as a matter of course, all duties are condemned by those who must now be heavily taxed to meet the expenses of the late war. Beet root sugar might easily be produced in many places in India where the beet thrives so well. But in the last number of the *Indian Economist* there is a letter published originally addressed to the *Sacramento Union*, in which the writer declares it as his opinion that sugar can be made more profitably from melons than from beets. If such be the fact, India might do much in the work of producing sugar in this way. In the cultivation of melons there is much less expense than in that of beets. The labour of hoeing, weeding, &c., is twice as great in the latter than in the former case. Then melons when gathered are ready for the mill, while beets have to be washed and their crown of leaves and rootlets cut off. Large quantities of melons can be sold for direct consumption whenever worth more in that way than for sugar; they yield their seed every year with no extra expense for cultivation. Beets require a second year, with hand and careful culture, and gathering of the seed. Melon seeds will yield sixteen per cent. of their weight of excellent table oil. Beet seeds, beyond what are needful for seeds, are of no value. The yield per acre and the cost of manufacture are decidedly in favour of melons; they require less time, less bone-black, less machinery, less power, and less fuel, because no water is added, which cannot be said of beet juice by the ordinary process of extraction. The natural purity of the juice of melons is so superior to that of beets, that whilst the melons furnish an agreeable "food and drink," and a delicious sweet, the juice of beets is so acrid and herbaceous, as to be wholly unpalatable. The defecation and refining processes for melon juice and sugar are therefore attended with far less trouble and cost. That part of the beet which in many instances grows above ground, exposed to the sun, is of little or no saccharine value, whilst the hotter the sun and the drier the air, the better and sweeter the melon, and the larger, the sweeter generally; whilst the reverse is true of beets. Beet juice and pulp exposed to the air, will turn black in fifteen minutes, and fermentation commences immediately from the rasp. Melon juice and pulp will not blacken at all, and will not begin to ferment in the open air before the third day from the melon. Beets are remarkable for their power of extracting alkaline and saline substances from the soil, which injures their value for sugar. Melons are equally remarkable for letting those salts entirely alone in the soil. No centrifugals or presses are required to separate the juice from the pulp, as with beets; but all except the rinds and seeds go into the defecating kettles together. Cloth-filters, concentrators, and a vacuum pan are as necessary as for beets. The buildings are less costly, because requiring less strength to hold in position the centrifugals and other necessary machinery for beet sugar factories. The chemical processes of melon sugar-making do not differ materially from those for the making of beet sugar, except in their simplicity. Spirits in large quantities can be extracted from the fermented juice of melons and the refuse of the factory, and "pure cider vinegar" is made therefrom in ten hours that cannot be distinguished from the genuine article. The melon rinds, with dry grass or straw, make an excellent food for milch cows. These advantages ought to meet with attention from those who are in such a praiseworthy manner endeavouring to develop the resources of this country. If what is stated be true, the experiment of the manufacture of sugar from melons, which are so plentiful in India, is surely worth a fair trial.

CAROLINA PADDY.

RESULT OF THE EXPERIMENTAL CULTIVATION OF CAROLINA PADDY SEED IN THE NORTH-WESTERN PROVINCES DURING 1870.

Allahabad Division.

Allahabad.—The Collector distributed the seed among Dr. Pilcher, Superintendent of the Central Jail; Baboo Pearee Mohun, a Pleader of the High Court; and a Mr. Carbery. Dr. Pilcher reports that his experiment was a failure; 17 chittacks of seed were sown, the yield was 12 chittacks and 15 seers of straw. The seed was sown on 1¾ biswas of land, which was not manured, but irrigated. He states that many of the ears were empty, but cannot account for this. Baboo Pearee Mohun planted his seed under the bund of a tank; the bund burst, and the whole was washed away. Mr. Carbery has not reported the result of his experiment, although repeatedly asked to do so. In this district the experiment has not been fairly tried. It can only be by chance if experiments of this kind succeed in the hands of mere amateurs, and if they fail in their hands, the impression must remain that there might have been some ignorance or mismanagement which would have been avoided, had the experiment been carried out by professional cultivators.

Cawnpore.—The experiment in this district has been a total failure owing to the rains having set in unusually early, and swamped the seed that was sown. The Collector is desirous of trying the experiment on various conditions of soil and cultivation. The Commissioner recommends that a good supply be placed at the Collector's disposal.

Humeerpore.—The Collector of this district alone is able to submit a report showing satisfactorily that under similar circumstances the yield of Carolina rice exceeds the out-turn from at least one kind of the ordinary country grain. His method of conducting the experiment was to sow an equal area in the same field with foreign and country seed, and to treat both alike. Unluckily, the amount of seed varied; but the out-turn was 18 seers produce out of 15 chittacks of Carolina

seed, and 20 seers produce out of 3 seers country seed. This was in Muhoba alone; the site selected was the bed of a tank, and probably this experiment was carried out under favourable conditions. In other places, the experiment failed: in one case, the crop was destroyed by cattle; in another, unsuitable land was selected. The Commissioner suggests that Mr. Harrison may be entrusted with seed to carry out further experiments in another season.

Jounpore.—The Deputy Collector sowed some seed in the Municipal garden, the result was 13 lbs. of clean grain out of 2¼ lbs. of seed.

Banda and Futtehpore.—In these two districts the experiments were a total failure: the heavy rain, early in the season, quite destroyed the growing plants.

The Commissioner of Allahabad, in submitting the above reports, remarks, that to have such an experiment satisfactorily carried out, it is essential to have a good supply of seed early, so that there may be no hurry in distributing it or in selecting fields for the purpose; he also states that simple instructions should be issued to the district officers. They should be directed to select at least six or eight localities, to choose land adapted for rice in general, and not to try what they can make out of unlikely kinds of soil, to sow half of each selected field with the Carolina and the usual country grain in equal proportions of seed, and to treat each alike, and then to report the out-turn. If any difference in cultivation suggests itself, it should be carefully tried and reported.

Rohilkhund Division.

Bijnour.—The quantity of seed assigned to this district is reported as being very small: it was distributed among Mr. Treshan, a zemindar, and several natives. Mr. Treshan reports very favourably indeed of the result of his experiment, but the Natives seem to have been less fortunate. The Collector recommends that Mr. Treshan be allowed to try the experiment again this year on rather a larger scale. It may be said that the experiment has not altogether succeeded, for the yield is rather less than half that of country seed both in grain and straw; but, with care and plenty of water, which is essential, the result might be better.

Moradabad.—Ten pounds were sent to this district, which, when winnowed and cleaned, yielded 6¼ lbs. As the rainy season had been for some past years rather uncertain, the Collector thought it best to try the sowing in several rather than in two or three spots. Accordingly, the seed was distributed in various quantities to 12 respectable farmers, who appear in some cases especially to have taken considerable care in carrying out the Collector's directions. They were instructed to sow broad-cast about one-fourth of the weight usually sown with common country seed. The four best out-turns were given from sowings made in the first week of July, while the crop was cut in the third and fourth weeks in October. Of the 6¼ lbs., 11 oz. were swamped after sowing, leaving 5 lbs. 10 oz. sown in 13¼ biswas pucca in ten different villages. The yield, on the whole, was 148 lbs. of rice, giving an average of 26 fold. One of the farmers, whose experiment was somewhat successful, wishes to try the sowing again next year with double the quantity he first received. The other six cases were rather feeble, and require no notice. The Collector has kept the present crop of rice, and proposes distributing the seed in larger quantities this year. The Collector will be glad to learn results of other districts and any direction the Board may be pleased to issue regarding the time which may be found to be the best for sowing, and the quantity which may have been found best for a certain area.

Budaon.—No experiments were tried in this district.

Bareilly.—The amount of paddy seed received in this district was 5 seers. Three seers of this was sown in the Deputy Collector's garden at Pilleebheet, the remainder by two landlords in Baheree. The experiments in the garden proved again the great amount of moisture this variety of rice requires. Two of the beds were more wet than the remaining two; in the former the stalks of each plant varied from 10 to 12, in the latter from 7 to 8. The head of an average looking plant, when counted gave 365 grains, of which 332 were good and the rest empty. The out-turn was above the average of country rice, but the produce is coarser than even 3rd class rice. The seed given to one zemindar germinated, but failed ultimately, and that to the other gave an out-turn in the proportion of about 2½ pucca Bareilly maunds to the beegah, which is well above average.

Shahjehanpore.—Mr. J. Powell, of the Rosa Factory, reports that as he had no proper rice lands in this district, it was thought best to sow the rice in different soils under different circumstances, *i. e.* (1) *in low land liable to inundation*; (2) *on the side of a jheel where the land had not been previously well-worked*; (3) *in a garden plot.* The seed was first sown and afterwards the plants were laid out singly or in pairs: it was then found that each plant shot out from 6 to 10 strong stems. In the low land, liable to inundation, the show of plant was magnificent; but a flood came and entirely swamped a portion, and, in receding, left a slime on the leaves; these plants sickened, the ears came out weakly, and did not fill well. Where the plants were not altogether swamped, the return was excellent. By the side of the jheel the out-turn was not good: the plants were immersed in water at the time of seeding. In the garden, where the plants never had more than an inch of water on them, and where the ground was only just moist at the time of seeding, the crop was beautiful, a picture to look at, the grain of a bright golden hue, every ear pendent, stalks high and strong. Mr. Powell concludes that the rice is suitable to all lands which can be kept fairly moistened for two months, or that may have from two to four inches of water on during that time, provided the lands are properly prepared and weeded. The seed should not be sown until the end of July, as the rice matures early and should not be allowed to ripen before September.

Kumaon Division.

Kumaon.—Commissioner stated, in October last, that part of the paddy was then quite green, and he did not expect he would be able to report on the out-turn until the close of November. He now regrets that in consequence of the great sickness at the important time, the seed was neglected, and that no satisfactory data can be given. The Commissioner tried some with servants to look after it, but they fell sick, and the wild pigs destroyed it.

Meerut Division.

Allygurh.—The Collector reports that the seed was made over to the Secundra Rao Tahseeldar for trial, as that part of the district is most damp. A portion was given to two cultivators, who sowed it in marshyland, and who gave their best attention to its cultivation; but the res it is quite a failure, the grain produced being very small, and stalk short and unhealthy. Mr. Chase is of opinion that the climate of Allygurh is not suitable to rice, and that it does not appear advisable to continue the trials of any paddy seed.

Dehra Doon.—Superintendent says that the plants that were transplanted throve best, but the continued heavy rain did not agree with the plant, or rather it was the absence of sun that did the harm. The average produce of Carolina paddy would be, by the results, about 15 maunds to the acre; ordinary country rice produce about 25 maunds. There can be no doubt but that the Carolina paddy would thrive well in the Doon, and would produce about 30 maunds to the acre if properly tended; but Mr. Ross doubts if it would ever come into much favour: it is coarse and utterly without flavour; none but the poorest of the poor would eat it.

Saharunpore.—Collector states that so small a quantity of seed was sent him that he distributed the whole (8½ seers) to one Kour Sein, of Harotee. The result is the same as that described in Mr. Webster's letter last year (1869). In vigour, amount of produce, and especially in strength and size of stalk, it far exceeds the Native rice. Kour Sein sowed also 9 seers of last years' (1869) seed in a field. The crop was a fine one, and quite as high and strong as the new seed crop, but the out-turn was not quite so good. Mr. Jenkinson recommends that this experiment should be tried again next year, for in introducing a new kind of rice it is most important to ascertain whether the seed, produced in this country, continues equal to the imported seed, or whether it deteriorates, and states that it would not be fair to come to any conclusion on this point from only a single experiment carried out on so small a scale. The cultivation of this Carolina rice by Kour Sein has been so successful that the Collector is sure that if seed were obtainable, it would be very extensively sown, and that in time it would perhaps entirely take the place of the Native rice. The Collector further states that the Carolina rice is coarser than Native rice, but in flavour is only inferior to the best Native rice, and that the Natives are of opinion that it is equal to the 2nd quality of rice produced in the district, and will have no objection to take to Carolina rice.

Moozuffernugger.—Collector forwards a report drawn up by the Assistant Collector, and states that he is afraid the experiments must be looked upon as a failure; for the result on Oodey Ram's land, four maunds from 12 biswas would only give about 6½ maunds per beegah, and this for good land and well-watered would be an indifferent crop of ordinary Indian grain. The Collector himself saw the particular field to which reference is made, and before the paddy was cut it struck his eye as in appearance below the ordinary average. The Commissioner, in submitting the reports, remarks, that there is so much similarity in soils, in humidity of atmosphere, and in water-supply in Saharunpore and Moozuffernugger that he would certainly suppose the results to be identical, whereas it will be seen that they are contrary. Mr. Lind concludes that the cultivation was carefully attended to in the former district, and neglected in the latter. Adverting to the objection urged by Mr. Ross in regard to the rice being coarse and without flavour, the Commissioner states that the nutritive qualities of the grain can best be ascertained by chemistry, but he can hardly fancy the zemindars of Saharunpore would be eager in enquiries after the seed, if the rice is so poor as described by the Superintendent of the Doon.

The Collector forwards another report by Mr. Cadell, the Settlement Officer, whose "experiments have been far more satisfactory, and offer a far better guide to the probable capabilities of the seed, under favourable conditions and with intelligent management, than the experiments which were made under the superintendence of the district officials, and which were reported on by Mr. Donovan." Mr. Palmer says that if seed is to be again distributed next season, it would probably be best to entrust direction of the cultivation to Mr. Cadell, and to confine the experiment to those estates in which, as agent for the Court of Wards, he is able entirely to control its working.

Benares Division.

Ghazeepore.—States that before the receipt of the Carolina paddy seed from the Board some was procured from the Agricultural Society, so that the amount sown in this district was larger than in others. Adds that the seed sown under his personal superintendence near the Cutcherry was a failure; that throughout the district it met in several places with unfavourable weather; but in many cases succeeded well and produced from 8 to 16-fold crops.

Azimgurh.—Collector states that the 13 lbs. of Carolina seed received from Commissioner's office, 8 lbs. was sown under the personal supervision of Mr. Sladen in June last. The seed was sown in land belonging to zemindars of a village adjoining the Collector's house; some in the manner in which the Natives sow their own rice, some in drills prepared after the fashion described by the American Consul in his memorandum submitted to the Government of India. Owing to the excessive rains the experiment was unsuccessful. The seed sown in the drills in damp ground was drenched by the rain and did not even germinate. The other seeds germinated, and the rice grew to some height, but rotted within a month from superabundant rain. The Collector adds that Mr. Sladen received about 5 lbs. of the seed this year for experiment, but that the fact was not brought to his notice, nor was

[illegible] of the experiments of the seed till informed by the Commissioner. The season for sowing this has now passed, but the result of the sowing [illegible] will be looked after by the Collector; at present it seems to be [illegible] the seed is not suited for a country where the rains are heavy and continuous.

Mirzapore.—Collector reports that the Carolina paddy seed received by him was distributed among several gentlemen, of whom only one furnished the result of his experiment, which was a failure. This gentleman states that "he sowed the seed in ordinary garden ground, but that it was attacked by a kind of insect which destroyed the grain by perforating the grain while yet in the milky stage, and leaving it quite empty. Of the two seers sown all the plants germinated; but the yield of the grain was 14 seers, or half less than was actually sown."

Goruckpore.—Collector states that last year the Carolina paddy seed was distributed to a Mr. Palmer and a certain zemindar in Deoree. Mr. Palmer reports that the result has not been good owing to the plants having been destroyed by inundation and flies, and that he will make a further trial this year from the small quantity of the paddy he has secured. The Deoree zemindar reports that the plants were destroyed by heavy rains, the plants being under water for some time. A further supply of paddy seed has been sent to the zemindar for this year's trial, being the half retained of the seed in 1870.

Benares.—Commissioner, in submitting the above reports, states that it is apparent that the season was unfavourable for the experiment, and that moreover from the Goruckpore and Mirzapore reports, it is evident that the seed, when sown, is liable to attack from insects. The system of distributing new varieties of seeds, &c., for experimental culture, unless to officers who take an interest in such matters, must, the Commissioner fears, prove a failure, and regrets now that he did not keep a portion for Benares, and supervise it himself. Is of opinion that to give a seer to one man and a seer to another, as was done in the cases reported, can never profit. Adds that there is a public garden in Benares, superintended by a skilled gardener; but that the institution lives from hand to mouth, depending on petty subscriptions; its value for experiments is consequently reduced to the lowest.

Extract paragraph 8 of letter No. 393, dated 20th April 1871, from the Superintendent, Botanical Gardens, North-Western Provinces.

Carolina Paddy.—This rice has been grown on a small scale; 2 lbs. were sown in a small plot of land in June last, and transplanted on to a kutcha beegah of land, and was cut down in October. The out-turn was 471 lbs. or about 6 maunds, equal to a yield of about 30 maunds per acre. An adjoining Native farmer, Konr Singh, obtained 32 maunds per acre. The straw was about 5 feet in height and most luxuriant.

OPIUM CULTIVATION IN CHINA.

From G. W. Caine, Esq., Her Britannic Majesty's Consul at Hankow; to the Secretary to the Government of India, Financial Department, Calcutta,—No. 42, dated British Consulate, Hankow, the 31st July 1871.

I HAVE now the honour to report on the cultivation of the poppy in this part of China under the heads mentioned in Mr. Wade's despatch of 15th June last:—

Question 1st.—What sort of crop (whether good or bad) has been gathered, especially in the South-Western Provinces, Yunnan, Szechuen, and Kwei-Chow; and in the North-Western Provinces, Kansu and Shênsi; and in the North, in Manchuria?

Answer 1st.—It is generally reported at Hankow by opium brokers from up-country that the crop of opium in Szechuen for this year 1871, is an unusually good one, the weather having been dry and fine.

Concerning the crops in Yunnan and Kwei-Chow, it is impossible to speak for certain, as but little of the drug arrives here directly from those Provinces. It may, however, be surmised that the fine weather existing in Szechuen, has extended to the neighbouring Provinces, in which case a good crop may be expected; and, indeed, there are abundant signs of a hopeful feeling existing in Hankow amongst native opium merchants as to this year's crop. No information has been able to be obtained here about crops in Shênsi and Kansu, but the Mahomedan rebellion, which has so long existed in these Provinces, and which has only just been suppressed in one of them, Shênsi, will have effectually prevented any very extensive cultivation of the poppy. Concerning Manchuria, nothing whatever is known here.

Question 2nd.—Any particular circumstances that have affected or are likely to affect the out-turn?

Answer 2nd.—The unusually fine weather which existed in Szechuen during the beginning of the year, and of which the low condition of the waters of the Yangtse here up to July was a proof, would be eminently favourable to the opium crop, nor have any allusions been made to ravages arising from blight or disease.

Question 3rd.—Is cultivation of the poppy generally and especially in the writer's own vicinity extending, or the reverse?

Answer 3rd.—In the Province of Hupei in which Hankow is situated, the area of cultivation appears to be much as formerly. The chief opium district is in the west of the Province, bordering on Szechuen in the prefectures of I-chang and Huh-an-fu.

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Here a considerable quantity is grown and called Chiao-tu. It is said to be of excellent quality, but the quantity produced only just suffices for local consumption, though the article is much sought after when it can be obtained, and a heavy price is paid for it. It is likewise stated that at several places in the country, the peasantry cultivate small quantities of opium by way of making a few cash. The quantity is infinitesimal in amount, and can have no effect on the opium market; but it may be a straw showing how the wind blows. It is doubtful, however, whether the soil of this Province is fertile enough to render opium cultivation profitable, and tea, the staple of Hupei, and possessing the double advantage of being profitable and legal, will probably prevent any great extension of poppy cultivation. In the neighbouring Provinces of Hunan and Honan, some attempts have been made towards the cultivation of the poppy; but the large imports of foreign and native opium into these Provinces show the amount to be but slight. A beginning, however, has been made, and the cultivation of the poppy may, in the fertile country of Honan, be profitably extended; but the Province of Hunan can never, from the poverty of its soil, become a formidable competitor for growth of opium. In Szechuen, nearly half the Province is already appropriated for opium, and the cultivation of it being profitable, it may safely be supposed it will be extended further if possible; but the soil of West Szechuen being less fertile than that of the east portion, any further increase will be impeded. Of increase or reverse in the Provinces of Yunnan and Kwei-Chow, no statistics are obtainable, except that, so far back as 1836, the fertile spots in that Province are mentioned, in a memorial addressed by Choo-Tsun to the then Emperor, as being appropriated for the growth of the poppy; and it may safely be stated now that the produce is very considerable, though the Mahomedan rebellion existing there would be a check to any great extension. An estimate made in 1869 gives piculs 20,000 for annual yield of Yunnan, piculs 15,000 for Kwei-Chow, and piculs 6,000 for Szechuen. These figures, however, are open to criticism, for it seems remarkable that the Province having the largest export of opium should produce the smallest crop.

Question 4th.—Any action of the imperial or local authorities affecting opium?

Answer 4th.—No direct action has been lately taken against its cultivation. Heavy transit dues and an increased land tax are the only means used.

Proclamations are, of course, continually being issued by local Magistrates, exhorting people to cultivate cereals and abandon opium for more useful crops; but, as the officials are the chief consumers of the drug, and, in addition, derive a considerable revenue therefrom, these proclamations are intended only as a means of exacting more money from the cultivators.

Question 5th.—Is the consumption of native opium extending in the interior and in the treaty ports, and how is it affecting the consumption of Indian opium, and whence is the native opium procured which is consumed in the writer's vicinity.

Answer 5th.—The consumption is decidedly on the increase, and more native opium comes down here every year; but it does not appear as yet to have any effect on the foreign drug. The total of opium-smokers is becoming larger every year, and their number increases much more rapidly than the amount of native opium produced. It may even be stated that the increased consumption of the native article has a favourable effect on the sale of the foreign drug. Its cheapness increases the number of smokers, and they, having acquired a taste for the drug, betake themselves ultimately to the best kind they can procure, which is, of course, the Indian opium.

It is stated here by foreign firms that, until the production of opium equals the demand, and the area of cultivation bears a more equal proportion to the increasing number of consumers, no fears need be entertained for the Indian opium, and even then the superior quality of the foreign drug would continue for some time to give it an advantage. The want of rapid modes of transit is a further disadvantage, and the Indian may be expected to hold its own for some years, and its sale perhaps rather to increase than diminish.

The following table shows the import of opium into Hankow for the years 1868, 1869, 1870:—

Opium imported.	1868.	1869.	1870.
Malwa	Piculs 3,007	Piculs 2,449	Piculs 3,636
Patna	„ 99	„ 272	„ 215

Szechuen is the greatest producing district for Hankow, almost the entire importation coming from that Province. The quality is not first-rate, but its cheapness makes it popular with the poorer classes. Some is also imported from Yunnan, but the long distance, the difficulties of transit, and the heavy taxation, prevent any large importation. Its quality is said to be excellent, nearly equalling that of Indian opium, and the

contermINous Province of Hunan is largely supplied with it. It is, however, a significant fact that this Province is likewise the largest importer from Hankow, as a centre of the Indian drug, so that the best native opium would seem, under the most favourable circumstances, unable to compete successfully with the more tasty article. The Yunnan opium is undoubtedly the most formidable rival the Indian drug possesses, but the cultivation of it having been in existence for the last 50 years, the maximum of extension may have been attained. It is largely imported into Hunan and Szechuen, and Chueng-ching-fu, in the latter Province is a central depôt for the Yunnan opium as Hankow is for the foreign. From the expense of carriage and taxation Szechuen can now hardly be reckoned as a consumer of the foreign drug, though, in former years, some little was sent. The Yunnan opium has to some degree taken its place from its being both excellent in quality and cheap and close at hand, but the opening up of a port in Szechuen to foreign steamers would probably have the effect of increasing import of foreign opium.

Question 6th.—What the relative prices are of native and of Indian opium, and whether anything is known that is likely to affect them?

Answer 6th.—The prices ruling in Hankow market are now, for—

Yunnan, 1st quality,		Tls. 380	per 100	catties.	
Kwei-chow	..	" 370	"	"	"
Szechuen	old	" 320	"	"	"
"	new	" 290	"	"	"
Foreign opium from 500 to 540 taels per chest.					

Indian opium is consumed chiefly by the wealthier and official classes, its dearness having always prevented its becoming a common article of consumption with the poorer classes. The native article is consumed by the poor exclusively as inferior teas are in England, and the great extension of opium cultivation in China has been induced to supply a demand which the more expensive drug was unable to satisfy.

The rich continue, and will continue, to smoke the best that can be procured, and, unless the foreign drug becomes so adulterated as to become inferior to the native opium, it will continue to hold its own in the market. The price of foreign opium has remained nearly stationary here for the last two or three years, ranging from 500 to 550 taels per chest, nor is there much expectation here of its being lowered. The price of the native article has a slow, but very slight, tendency to decrease, the increased production being compensated for by the increased and increasing number of consumers, and, until the one has overtaken the other, no important reduction can be expected. The following prices of various kinds of native opium, given by Baron Richtofen who traversed the Province of Hunan in the spring of 1870, may prove interesting, but their accuracy cannot be vouched for:—

1st.—Kunan	900	to	1,000	cash a tael.
2nd.—Shensi	800			" "
3rd.—Hunan / Shansi	600	to	700	" "
4th Szechuen	480	to	500	" "

1,100 cash = a dollar 4s. 3d., and 16 taels = 1 catty, 100 of which make a picul, equalling 133⅓lbs.

Question 7th.—Any facts regarding the position of Persian, Turkish, or other opium (not Indian or indigenous) in the market?

Answer 7th.—A large foreign firm at this port imported some Turkish opium, but it being found unsaleable here, it had to be returned to Shanghai.

THE COTTON TRADE BETWEEN THE NERBUDDA VALLEY AND CALCUTTA.

From Harry Rivett-Carnac, Esq., Cotton Commissioner, to the Secretary to the Government of India, Department of Agriculture, Revenue and Commerce,—No. 5428, dated Allahabad, the 4th October 1871.

I have the honour to acknowledge the receipt of your letter No. 5, dated 13th July, regarding the trade in cotton between the Nerbudda Valley and Calcutta, and desiring me to investigate the matter and to report the result of my inquiries, for the information of His Excellency the Viceroy and Governor-General-in-Council. I would now desire to report that, on this subject being brought to my notice, early in the year, I caused inquiries to be made, and that ascertaining, as will be explained in a later paragraph, that the exports alluded to by the Officiating Chief Commissioner of the Central Provinces were inconsiderable and admitted of satisfactory explanation, I did not pursue the subject further. On the receipt, however, of your despatch under acknowledgment, it appeared desirable to obtain the latest information on the subject for transmission to the Government of India, and, as I was on the eve of starting for a tour in the Central Provinces and the Berars, I delayed a detailed report, until I could re-visit the cotton districts, and obtain from the Railway Companies the tabulated statements of traffic, taking up, at the same time, the whole question of the trade of the Central Provinces with Bombay and Calcutta,—a subject which has been treated of at length in my memorandum, copy of which was submitted with my letter No. 5312, dated the 25th ultimo. Those circumstances will, I trust, account for the delay in replying to your despatch under notice. Further inquiry has confirmed me in the view that, although some trade in cotton does doubtless continue to exist between the Nerbudda Valley and the East, still that there is no ground for supposing that the trade is "shifting towards Calcutta;" but that, on the contrary, this trade with the East is on the decline, having been affected already by the completion of the main line of the Great Indian Peninsula Railway between Bhosawul and Jubbulpore. Nor, indeed, unless I read the letter incorrectly, do I understand Colonel Keatinge to desire to convey that the trade is shifting towards the East. The Officiating Chief Commissioner noticed that cotton was being sent from the neighbourhood of Nursingpore in the Nerbudda Valley to Calcutta, which place is much further from Nursingpore than is Bombay, and this circumstance very naturally struck him as being peculiar. But, as I shall now attempt to show the quantity sent from this quarter to the East was not larger than that sent in former years, whilst the existence of a trade between the Nerbudda Valley and Mirzapore and Calcutta is a circumstance that can be readily explained.

First, in regard to the quantity of cotton sent from the Nerbudda towards the east during the past season.

The following figures of the traffic by road have been furnished to me by Mr. Grant, Commissioner of the Jubbulpore Division:—

Statement of the cotton exported by road over the outer boundary of the Jubbulpore Division, during the following months of 1871.

January.	February.	March.	April.	May.	June.	Total.
Mds. 402	Mds. 710	Mds. 3,474	Mds. 2,340	Mds. 2,528	Mds. 574	Mds. 10,048

Total maunds 10,048,* or about 2,000 bales of 400 lbs. each. The traffic ceased altogether at the commencement of July.

Now, these exports by road were not made up exclusively of cotton sent from the Nerbudda Valley, but included all cotton sent eastward by road from the Central Provinces and Berar cotton-growing country. Some quantities were sent even from Oomraotee to Mirzapore, as explained in a foot-note of my memorandum on the railway traffic already referred to—

"This year, even a consignment of Oomraotee cotton was sent from Oomraotee to Mirzapore on bullocks by a Brinjaree Naik of Berar, who not caring to keep his bullocks idle, loaded them with cotton, and brought back sugar and brass-ware from Mirzapore."

and the whole quantity sent by road, of which the Nerbudda consignment formed but a part, amounted to only 10,048 maunds, or 2,000 bales of 400 lbs. each, or in other words, from 700 to 1,000 cart-loads. The quantities of cotton sent from the Nerbudda Valley eastward by railway, from the 1st of January 1871 to the 30th of June, were as follows:—

	To Cawnpore.	To Mirzapore.	To Buxar.	To Calcutta.	Total.
Khandwa	..	56	..	..	56
Garrawara	..	158	..	..	158
Nursingpore .. .	..	315	..	..	315
Chindwarrah	..	512	..	136	648
Jubbulpore	2	5,216	15	6,970	12,213
Total Maunds...	2	6,297	15	7,106	13,420

or about 2,700 bales of 400 lbs. each. Adding these figures to the exports by road already given, we have a total of 23,471 maunds, or 4,700 bales, sent eastward by road and railway during the season.

The figures given below shew the exports of cotton in maunds in this direction during former years:—

	1863-66.	1866-67.	1867-68.	1868-69.	1869-70.
By road	73,000	41,353	[illegible]	21,164	[illegible]
By rail	..	17,4[illegible]	[illegible]	4,249	[illegible]
Total Maunds ..	73,000	58,[illegible]	[illegible]	25,353	[illegible]

and these figures would seem to indicate a gradual falling off, for reasons to be noted later, in a once important trade. That

* The maunds used throughout are of 82 lbs. each.

some trade in this staple should continue to exist between the eastern part of the Central Provinces, is only natural from the following circumstances. In the first place, it is to be remembered, that until lately, the whole trade of this tract was with Mirzapore and the East. Until the completion of the railway, not only the Nerbudda Valley, but even the old Nagpore Province and some portions of the Berars, were entirely cut off from Bombay, and, consequently, transacted the whole of their business with Mirzapore and the North-West Provinces. To Mirzapore the cotton of that part of the country used to be sent, and in exchange, copper, spelter, sugar, European piece-goods and the comprehensive *feroos* of the natives used to be imported by such trading towns as Jubbulpore, Nagpore, Hinganghat, and Oomrawtee. The large firms whose head-quarters are at Mirzapore had, and in many cases still have, their agencies at these towns, with subordinate branches in all the circles of supply of which these towns are the trade centres. And, as explained in my letter on the Wurdah Valley Railway, the cultivators being under advances to the agents of these firms, the produce is gathered in and disposed of by the mahajuns who have been for long years in the habit of sending annually large consignments to Mirzapore. In the Berar country, the effect of the opening of the railway communication with Bombay has been to induce some of the Mirzapore firms to open branches at Bombay. The native agents in the up-country markets send down the cotton to that port, or sell it on the spot to the European agents who are now established at all the marts to the south of the Southpooraha, and who supply the European firms in Bombay. In the Nerbudda Valley the state of the case is somewhat different. The completion of the main line of the Great Indian Peninsula Railway on the north of the Southpooraha is of such recent date, that the effect has not yet been fully felt, and the trade thus still continues to run to some extent in its old channel. But everything seems to indicate a change which is not likely to be long deferred.

The following extract from the letter of Mr. LeMessurier (Agent of the Great Indian Peninsula Railway) to the Chamber of Commerce, Bombay, given in the Appendix to this Report, explains still more fully the reasons for the exports towards the east. Mr. LeMessurier says :—

"I was at Garrawarra myself about the date referred to in Colonel Keatinge's letter, and I had a conversation with the agents who were sending their cotton by cart from near Garrawarra to Mirzapore. The reason assigned by them was, that if the bullocks and carts thus occupied were not employed at the particular time in going to Mirzapore, they would be at home idle, as there was no work for them, and that the saving between sending by rail from Garrawarra to Mirzapore *viâ* Allahabad, or by cart *viâ* Meyhere and Rewah to Mirzapore, was equal to eight annas a doora only,—time being as of no value; and they contrived to return from Mirzapore with merchandize for Rewah and other places on the road.

"Mirzapore, as the Chamber is well aware, is the mart to which all the Central Province produce has found its way for very many years; and the agencies are so firmly established—the whole trade being in the hands of the Hindoos—that we cannot possibly alter the course of such trade in one season, particularly as boats on the Ganges are even now competing with the East India Railway as carriers of cotton from Mirzapore to Calcutta."

There is yet another reason for the cotton of Central India finding its way to the East. Of late years, cotton-spinning and weaving mills, worked by steam power, have been established at Cawnpore and in the neighbourhood of Calcutta. A certain percentage of cotton of a superior quality is required in these establishments for the finer class of goods manufactured there; and the cotton of the Central Provinces suits this want exactly. The consequence is that consignments of cotton are annually sent, not only from the Nerbudda Valley, but also from Hinganghat, to these mills. The figures of the exports for the past two seasons are given below :—

	1869-70.	1870-71.
	Cawnpore.	Cawnpore.
Wardah	1,649	3,670

and the figures given in paragraph 6 of the exports to Calcutta are, to a great extent, to be accounted for by the requirements of the mills there. And, lastly, the cotton of the Nerbudda Valley—a cotton rougher in substance and shorter in staple than that grown south of the Southpooraha—is in great demand for the China market, as will be seen from the following extract from the letter of the Bombay Chamber of Commerce given in the Appendix. The Secretary writes :—

"The Chamber are further of opinion that the white short-stapled cotton grown in those districts of the Central Provinces and the North-West of India, which is suitable for, and principally exported to China, will continue to find its way to Calcutta as the chief port for the export of Indian cotton to China.

"Seventeen and twenty years ago, about a third of the quantity of the cotton exported from Bombay went to China. All this is now changed; and though the quantity of cotton exported from Bombay has, within half the period, more than double the portion now exported from this port to China is an inconsiderable item in the aggregate quantity."

To what extent the cotton trade done by Calcutta and Bombay with China is still sustained, will be seen from the figures given below; and it is to be noted that whenever the price of cotton in Europe falls, the demand for Indian cotton for export to China is comparatively brisk.

Exports of cotton to China during the following years reduced to bales of about 400 lbs. each.

Total exported to all Ports.			Exported to China.	
To 30th June.			To 30th June.	
	1870.	1871.	1870.	1871.
Calcutta	50,[illegible]	1,54,200	34,[illegible]	51,[illegible]
Bombay	5,13,22[illegible]	6,84,044	38,735	30,[illegible]

The above remarks will, I hope, show that the exports of cotton from the valley of the Nerbudda, noticed by the Officiating Chief Commissioner, were not caused by any extraordinary turn in the trade, but were the results of a long-established trade which, under ordinary circumstances, is not likely to be entirely diverted for some time to come. But, on the other hand, as regards the quantity sent from the Nerbudda Valley towards Bombay, the following figures will speak for themselves :—

Quantity of cotton exported to Bombay from the Nerbudda Valley in bales of 400 lbs.

1867-68.	1868-69.	1869-70.	1870-71.
12,000	11,400	11,000	23,200

The increase, it will be seen, is marked, and is doubtless to be attributed to the opening of through communication by railway. I have purposely included in the columns given above, the stations of Nimar, which are just beyond the Nerbudda Valley, as it may be assumed, not unfairly, that much of the cotton of the valley was sent to these stations before the through line was opened by His Excellency the Viceroy in April 1870. Some of the cotton shewn in the above statement comes from Central India, and strikes the railway at Khundwah; but the figures of these exports have been retained as they are included in former statements.

Letter from the President, Government Farm, Sydapet; to the Acting Secretary to the Board of Revenue, dated Madras, 29th June 1871.

Some discussion has lately arisen at the Farm as to how far cotton is a profitable crop when prices are as at present low, and the yield is so poor as the probable average yield per acre of ordinary native cultivation. I therefore requested Mr. Robertson, the Superintendent of the Farm, to institute a comparison from his own experience of the relative value of a cotton-crop and other dry grain crops grown on the same farms. The result which is given in Mr. Robertson's useful and accurate memorandum of the 20th instant, will, I think, interest the Board and Government. It seems to me to be very suggestive in respect to the narrow margin on which the production of cotton in most parts of South India stands, when prices are not abnormally high, unless by improved farming the general yield per acre and the quality of the produce can be raised. Cotton is an expensive crop to grow, harvest, and clean for the market, and is highly speculative and unsafe. When prices are low, it can therefore scarcely compete with fair dry grain crops, which are not less remunerative and more easily raised. Indeed, it is said that cotton-growers have lost this year, and that contracted cultivation may be anticipated during the year before us.

It will be observed that the yield on the farm is about 120 lbs. of clean cotton to the acre, with fair manuring and good cultivation; but the profits were scarcely, if at all, above those derived from ordinary dry grains under similar circumstances. The seed used was ordinary Cuddapah cotton. I fear, however, that 120 lbs. to the acre is considerably above the average yield of ordinary native tillage throughout the country. Mr. Carnac's estimate for the Central Provinces is considerably below this; and possibly 70 to 90 lbs. would be nearer the average yield of ordinary native cultivation. It will be in the Board's recollection that in a recent proceeding, the average yield has been estimated at 75 lbs. to the acre. With reference to Mr. Robertson's opening remarks I may observe that the price of cotton returned to the Board from the provinces, of which an abstract of the annual average is given below are probably not so accurate as they should be; and I think that it were

advisable to call the attention of Collectors to the matter. I think also that the quantities of cotton should be stated as far as may be possible; and that these statements should be prepared in lbs., the form in which all Cotton Trade Returns are kept.

	Per candy of 500 lbs. Rs.		Per candy of 500 lbs. Rs.
Ganjam	162	North Arcot	124
Vizagapatam	149	South Arcot	107
Godavery	138	Tanjore	150
Kistna	115	Trichinopoly	119
Nellore	138	Madura	122
Cuddapah	127	Tinnevelly	127
Bellary	120	Coimbatore	113
Kurnool	115	Salem	161
Madras	118		

If I might hazard an opinion on this matter it is that the cotton-trade of India very urgently needs systematic attention to the development of agriculture in general in which cotton will take a natural and wholesome place, say, in a rotation where mixed husbandry is adopted in districts where the soils and climate suit it. The improvement of tillage in general alone can enable the production of higher qualities of cotton, and effect a more favourable average yield. And until some such result is produced, the distribution of highly cultivated and exotic seed is, I fear, of very doubtful utility in this Presidency. The general average of tillage is too low to assure success by this means.

STATEMENT SHOWING THE PRICES OF COTTON (CLEANED) PER CANDY OF 20 MAUNDS OF 25 LBS. EACH, EQUAL TO 500 LBS. IN THE SEVERAL DISTRICTS DURING THE 12 MONTHS OF THE OFFICIAL YEAR 1870-71.

Districts.	May 1870.	June.	July.	August.	September.	October.	November.	December.	January 1871.	February.	March.	April.	Average.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganjam ..	[illegible]	172	165	125	165	139	150	154	154	136	132	128	162
Vizagapatam ..	[illegible]	168	159	157	144	140	152	149	150	150	134	131	149
Godavery ..	[illegible]	165	144	144	145	140	140	137	129	124	129	108	138
Kistna ..	[illegible]	155	141	117	119	112	115	112	112	108	121	98	115
Nellore ..	[illegible]	158	150	157	152	135	131	122	111	138	125	117	138
Cuddapah ..	13 to 24	190 to 190	110 to 150	160 to 165	100 to 164	160 to 160	150 to 160	90 to 160	95 to 140	90 to 140	90 to 140	93 to 140	95 to 140
Bellary ..	[illegible]	158	158	127	115	114	136	97	92	97	81	82	111
Kurnool ..	[illegible]	140	[illegible]	113	119	114	114	140	130	:	143	72	120
Madras ..	[illegible]	90	:	:	:	:	127	:	:	:	:	:	:
Chingleput ..	[illegible]	150	156	121	115	135	116	110	110	110	120	110	116
North Arcot ..	[illegible]	121	121	146	121	121	141	97	96	92	75	74	107
South Arcot ..	[illegible]	155	166	135	135	133	137	145	145	140	145	143	142
Tanjore ..	[illegible]	126	162	125	125	120	115	115	115	140	140	140	150
Trichinopoly ..	[illegible]	141	161	120	115	110	140	140	140	140	140	140	119
Madura ..	[illegible]	161	149	115	115	125	125	120	120	120	125	125	122
Tinnevelly ..	[illegible]	:	136	121	124	121	117	119	124	100	93	91	127
Coimbatore ..	[illegible]	:	130	197	192	197	135	132	134	139	140	138	113
Neilgherries ..	[illegible]	195	190	These are not cotton districts, and no information has been furnished.									161
Salem ..	[illegible]												
South Canara ..	[illegible]												
Malabar ..	[illegible]												

Memorandum

It is difficult to understand the extraordinary fall in the value of cotton said to have taken place in April 1871 in the Madras District:—thus, in the returns furnished to me, it is reported that while the value of cotton in March 1871 was 145 Rs. per candy of 500 lbs., it was, in the following month, worth only 95 Rs. or nearly 40 per cent. less in value. For the same month another district, South Arcot, reports an increase in value, amounting to Rs. 8 per candy. Five districts report no change in value, and the remaining districts show an average decline of less than 5 per cent. on the average prices of March.

Again, it appears strange that in two adjoining districts, Salem and Coimbatore, there should be such a large difference as 50 per cent. in the value of cotton; as there cannot be anything like this difference in the cost of getting the cotton of each district to market. If the cottons are of different kinds, it seems scarcely correct to classify them together.

In the Madras District the average of the monthly reports appears to be 115 Rs. per candy of 500 lbs., or about 3 annas 6 pies per lb.

The following "sets of crops" could be grown in this district in a fair season on soils similar to the best of those constituting the Experimental Farm. The results recorded are those actually obtained under fair manuring:—

Cotton and Maize (mixed). Occupied the land from September until June—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
120 lbs. of Cotton	27	3	6
300 lbs. of Maize	6	3	0
2,000 lbs. of Straw	8	0	0
Total ...	42	6	0

Gingelly, followed by yellow Cholum. Occupied the land from July until March—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
700 lbs. of Gingelly	29	3	3
750 lbs. of yellow Cholum	12	2	5
5,000 lbs. of straw do.	10	0	0
Total ...	51	5	1

Gingelly, followed by Tenney. Occupied the land from July until March—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
700 lbs. of Gingelly	29	3	3
250 lbs. of Tenney	10	0	0
600 lbs. of Tenney Straw	3	0	0
Total ..	42	3	3

Cumboo, followed by Horse-gram. Occupied the land from July until March—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
670 lbs. of Cumboo	13	6	4
6,000 lbs. of Straw	12	0	0
500 lbs. of Horse-gram	10	0	0
2,000 lbs. of Straw	5	0	0
Total ...	40	6	4

Gingelly, followed by Shawmay. Occupied the land from July until March—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
700 lbs. of Gingelly	29	3	3
280 lbs. of Shawmay	13	8	0
600 lbs. of Shawmay straw..	3	0	0
Total ..	40	11	3

Cumboo, followed by Green-gram. Occupied the land from July until March—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
670 lbs. of Cumboo	13	6	4
6,000 lbs. of Cumboo straw	12	0	0
580 lbs. of Green-gram	20	0	0
Total ...	45	6	4

Gingelly, followed by Green-gram. Occupied the land from July until March—

Average yield per acre—	Gross value per acre. Rs.	A.	P.
700 lbs of Gingelly	29	3	3
580 lbs. of Green-gram	20	0	0
Total ...	49	3	3

Maize, followed by Horse-gram. Occupied the land from September until April—

Average yield per acre—	Gross yield per acre. Rs.	A.	P.
1,000 lbs. of Maize	21	10	8
5,000 lbs. of Maize straw	20	0	0
4,000 lbs. of Gram Fodder	8	0	0
Total ..	49	10	8

The foregoing figures apply to our soil and circumstances. Though the gross value of each "set of crops" does not differ greatly, it must be remembered that the cost of harvesting and preparing for market differs very considerably. Thus, in the first "set" the cotton will be costly to gather and clean. Again, many native cultivators are content with a *single* crop without actual figures. I can say little regarding the gross value of the different grain-crops raised by ryots; still, if their average return of cotton is only 70 lbs. per acre, worth 3 annas 8 pies per lb., or 16 Rs. per acre, it is pretty evident, that after paying expenses of gathering, cleaning, and carrying to market, they can have but a very *small balance* left to meet expenses of cultivation, rent, &c., a balance which must be considerably less than would be left by any grain crop, Varagoo perhaps, excepted.

20th June 1871.

P.S.—I am very anxious not to be misunderstood in these remarks. I do not say that cotton-growing is unremunerative, but that to grow cotton-crops, yielding only 70 lbs. of cleaned cotton, is so in this district.

AGRICULTURE IN ENGLAND.

ESTIMATES OF THE YIELD PER ACRE OF WHEAT, BARLEY, OATS, RYE, PEAS, AND BEANS.

Being the statements of leading practical farmers for the several Poor Law Unions—taking the average of heavy, medium, and light lands, and of good and inferior farming throughout every district for which an estimate is given.

County and Union.	Wheat. Harvest of 1870, in Imperial Bushels per acre.	Wheat. An Average Crop would be, in Imperial Bushels per acre.	Barley. Harvest of 1870, in Imperial Bushels per acre.	Barley. An Average Crop would be, in Imperial Bushels per acre.	Oats. Harvest of 1870, in Imperial Bushels per acre.	Oats. An Average Crop would be, in Imperial Bushels per acre.	Rye. Harvest of 1870, in Imperial Bushels per acre.	Rye. An Average Crop would be, in Imperial Bushels per acre.	Peas. Harvest of 1870, in Imperial Bushels per acre.	Peas. An Average Crop would be, in Imperial Bushels per acre.	Beans. Harvest of 1870, in Imperial Bushels per acre.	Beans. An Average Crop would be, in Imperial Bushels per acre.
KENT:—												
East Ashford	36	32	32	40	40	48	..	..	30	30	30	30
" "	32	30	32	32	32	44	..	..	18	32	20	30
" "	24	30	27	32	30	36	..	..	22	30	20	28
" "	32	40	32	48	40	56	..	..	20	30	32	40
Average yield per acre	30½	32½	30½	38	33½	46	..	..	20½	31½	26	31½
West Ashford	30	32	44	50	46	56	..	..	22	36	22	40
" "	40	36	40	48	56	72	..	..	22	44	28	36
Average yield per acre	36	34	42	49	51	64	..	..	22	38	25	38
Bridge	30	32	30	37	32	44	..	..	20	34	16	32
"	24	32	24	36	32	48	..	..	16	26	16	32
Average yield per acre	30	32	27	36½	32	46	..	..	18	26	16	27
Bromley	32	..	..	..	40	..	..	..	..	..	..	..
"	34	..	40	..	40	..	..	...	..	..	..	..
Average yield per acre	33	..	40	..	40	...	..	..	..	..	..	..
Canterbury	30	32	36	48	48	56	40	40	28	32	20	34
"	30	36	34	40	36	56	..	...	24	32	16	24
Average yield per acre	30	34	35	44	41	56	40	40	26	32	18	29
Cranbrook—yield per acre	24	30	...	..	30	44	..	.	18	26	20	28
Dartford	28	28	24	24	40	40	24	24	16	16	16	16
"	28	30	30	40	40	60	..	..	20	30	..	.
Average yield per acre	28	29	27	32	40	50	24	24	18	23	16	16
Dover	32	32	36	36	48	32	..	..	34	30	..	..
"	32	32	34	..	28	..	..	..	24	..	28	32
Average yield per acre	32	32	30	36	38	32	..	..	29	30	28	32
Easter	30	36	32	40	44	56	..	..	24	32	24	32
"	28	30	32	40	24	40	..	..	20	28	24	32
"	40	30	40	44	38	60	..	..	28	32	28	32
Average yield per acre	33½	36	34½	41½	41½	52	..	..	24	34	25½	32
Elham	28	31	32	40	40	48	..	..	24	28	24	28
"	34	32	32	36	40	48	..	..	28	32	24	32
Average yield per acre	31	31½	32	38	40	48	..	..	26	30	24	30
Faversham	36	36	40	40	48	56	..	..	24	28	24	28
"	32	36	34	40	40	40	...	...	30	32	36	40
Average yield per acre	34	36	37	38	44	48	..	..	27	30	30	34
Hollingbourne	28	34	28	40	40	40	..	..	24	34	20	32
"	32	36	28	40	40	48	..	..	16	32	20	32
"	28	30	32	40	40	56	..	..	20	32	24½	36
Average yield per acre	30½	33½	29	40	40	48	...	..	27	30½	21½	33½

County and Union.	Wheat. Harvest of 1870, in Imperial Bushels per acre.	Wheat. An Average Crop would be, in Imperial Bushels per acre.	Barley. Harvest of 1870, in Imperial Bushels per acre.	Barley. An Average Crop would be, in Imperial Bushels per acre.	Oats. Harvest of 1870, in Imperial Bushels per acre.	Oats. An Average Crop would be, in Imperial Bushels per acre.	Rye. Harvest of 1870, in Imperial Bushels per acre.	Rye. An Average Crop would be, in Imperial Bushels per acre.	Peas. Harvest of 1870, in Imperial Bushels per acre.	Peas. An Average Crop would be, in Imperial Bushels per acre.	Beans. Harvest of 1870, in Imperial Bushels per acre.	Beans. An Average Crop would be, in Imperial Bushels per acre.
KENT *(Continued.)*												
Lewisham—yield per acre	36	30	..	..	24	40	..	..	..	..	40	40
Maidstone	32	40	32	48	28	48	..	..	30	40	26	40
"	36	..	34	..	40	..	...	..	28	..	18	..
"	32	32	...	..	36	40	..	..	22	34	20	36
Average yield per acre	30	36	33	48	34½	48	..	..	27½	32	24½	32
Malling—yield per acre	28	36	28	40	32	48	..	..	24	32	20	32
Medway	36	...	36	..	40	..	..	..	20	..	24	..
"	24	36	32	44	40	64	20	32	16	32	...	32
Average yield per acre	29	36	34	44	40	64	20	32	18	32	24	32
Milton—yield per acre	36	36	36	40	40	56	16	16	20	32	16	32
North Aylesford	32	36	36	48	24	50	..	...	20	36	20	36
" "	32	36	32	44	40	64	..	...	16	28	16	32
" "	20	34	28	40	32	32	...	..	20	32	20	30
Average yield per acre	30	36½	32	42½	32	56½	...	..	16½	32	18	32½
Romney Marsh	44	40	..	..	56	56	...	..	28	24	24	28
" "	52	40	..	..	60	60	..	..	32	26	36	36
Average yield per acre	48	40	..	..	58	58	..	..	30	25	30	32
Sevenoaks	24	28	32	40	30	44	...	..	28	32	24	36
"	28	32	...	...	32	36	..	..	20	30	16	24
"	24	28	34	40	32	44	...	..	20	24	22	30
Average yield per acre	25½	29½	33	40	31½	41½	..	..	18½	28½	20½	30
Sheppey	40	40	56	56	48	48	..	..	24	34	24	34
"	44	40	56	48	64	52	..	..	24	24	28	34
"	40	40	44	44	54	54	...	...	20	28	28	40
Average yield per acre	41½	40	52	49½	55½	51½	..	..	23	28½	24½	38½
Tenterden	32	28	24	24	32	36	..	..	24	16	28	40
"	40	24	...	..	20	40	..	..	20	32	16	32
Average yield per acre	36	31	24	24	26	38	..	..	22	24	20	36
Isle of Thanet	28	32	32	40	40	56	...	..	24	32	20	36
"	42	44	48	48	41	56	..	..	32	32	16	32
Average yield per acre	35	38	40	44	42	56	..	..	28	32	18	34
Tonbridge	30	36	32	40	40	32	..	..	32	32	20	40
"	32	32	..	..	40	52	..	..	24	28	20	28
Average yield per acre	31	34	32	40	40	52	..	..	28	30	20	34
Mean yield per acre for the county of Kent	31·4	32·6	33·6	42·1	38·9	49·6	20·5	20·0	23·7	29·6	22·0	31·6

Returns have not yet been received from the Bleau, Gravesend, Milton, Greenwich, Hoo, and Woolwich Unions. But it would appear from the above fifty-two Returns for twenty-four Unions that in the county of Kent, which for soil and climate, is known as "the garden of England," every one of the grain crops is deficient in yield. Wheat is 2·4 bushels, or 7 per cent. below an average; rye is 1·3 bushels, or 4½ per cent. below an average; peas are 5·9 bushels, or 20 per cent. below an average; and beans are 6·7 bushels, or 27 per cent. below an average.

The Foresters' Gazette.

BOMBAY, 21st November 1871.

CULTURE OF ORCHIDS.

(From the Englishman.)

Notes on Horticulture in Bengal from the pen of Mr. John Scott, Curator of the Royal Botanic Garden, Calcutta.

This paper, extending over 82 pages, treats fully on the culture of orchids in Bengal, and will amply repay perusal to those who admire this beautiful class of plants, while it will form a text-book to the few (whose number is however increasing) who take a pleasure in rearing them. Perhaps there is scarcely another tribe of plants which requires such close, constant, and patient care in rearing, if the owner wishes to bring them to perfection; and this may account, probably, for our seeing so few really good collections in Calcutta and its vicinity. When the cultivation of orchids first came into general notice, it was thought that they could be successfully raised under glass. This idea has, however, been exploded, and the thinly-thatched structures, similar to those used for *pán*-growing by the native betel-grower, have been adopted with decided success, as is fairly shown by the improved condition of the collection in the Botanical Gardens.

DEODAR PLANTING.

Note on operations in the upper Chenab division by Baden Powell, Esquire, Conservator of Forests, Punjab.

The situation of the existing forests, or rather remains of forests, is often so precipitous and inaccessible that even should it prove worth-while to construct lengthy slides and work out the timber, it will not be wise to make any expenditure for the purpose of replanting such places. The upper Chenab planting must therefore be, from natural causes, confined to the reproduction of existing forest tracts where the slope and aspect are favourable, and to the new plantation of such tracts of land as are available, under the necessary conditions, for successful growth. Fortunately, there is a considerable area of ground that might be selected without any injury to the grazing requirements of the somewhat scanty population of the valley. The Chenab valley is one where the deodar prefers the left or south side; but there is also deodar on the right bank, though of slower growth and (it is said) of better quality. After a careful review of the localities suited for planting, it is clear that there is the best situated and most easily available land on the right bank, much more than there is on the left. It will be an object of considerable importance to confine new plantations within reasonable limits,—to go neither too far up nor too far down the river,—for their supervision will become difficult. Moreover, it is of the first importance not to attempt planting near the extreme limit of growth as regards elevation, nor to go to the extremes of growth as regards latitude or longitude. Every consideration, therefore, points to confining the new plantations, and the operations for restoration of forests, to compact limits. I shall proceed first to notice the existing plantations; I shall then offer certain remarks on the treatment of deodar, and conclude with a list of the tracts, on either bank, which should be planted or restored. The existing "plantations" entirely of deodar are at Chau and Purti, on the right bank, and at Ajog, on the left bank, and opposite Purti. Operations were commenced in October 1866, thus:—

Purti	...	..	12 acres	.. . October 1866.
Do.	..	.	13 „	.. .. .. March 1867.
Ajog	..	..	8 „	.. .. .. „
Do.	..	..	13¼ „	.. .. .. October 1867
Chau	..	..	8¼ „	. .. „

These were all planted with the aid of water-trenches at 10 feet apart. Holes were made in the centre of the trench, each being 3 feet deep and 2 feet wide. In each hole 5 young plants were put (2 to 4 years old). The holes are 10 feet apart. In the autumn of 1866, therefore, 26,250 trees were planted in 5,250 holes, on 12 acres, and so on; and in all there were 55½ acres, with 24,280 holes planted with 101,926 trees, only one-fifth of which were supposed to remain ultimately leaving one tree with 10 feet space all round. The total expenditure up to the end of 1867 was Rs. 1,801, with a yearly cost of, say, Rs. 200 for maintenance. The planting cost is (including fencing and clearing) Rs. 29-2-0 per acre. The results of the 1866 plantings, examined in August 1867, gave a uniform result:—

11·2	per cent.	of holes..	..	..	..	..	5	trees were alive.
32·4	do.	do.	..	..	..	..	4	do.
16·3	do.	do.	..	..	..	..	3	do.
7·0	do.	do.	..	..	..	..	1	do.
2·6	do	do.	..	..	..	..	all had died.	
100								

The mortality among the four-year-old trees was much greater than that of the two-year-old. This is so constantly confirmed by other observations, that it may be laid down as a rule for observance that, in transplanting from natural forest seedling beds or from nurseries, two years' trees are as old as ought ever to be taken for transplanting. The Ajog and Purti plots are moraines found at the foot of the steep slopes of the hills or cliffs bounding the valley, and are at a very gentle incline. Chau is on a rather steep incline, but exhibiting the remains of cultivation terraces, which much facilitate the work. The elevation of the whole is about 7,500 feet, and I think it will be very desirable on the Chenab to keep to this limit where possible, and I should be disinclined to make plantations at any rate beyond 8,000 feet as an extreme limit. At the end of September 1868, 3,000 holes in each of the 3 plots were examined:—

In Purti 780 plants were dead (or 26 per cent.).
In Ajog, 333, or about 11 per cent.
In Chau, 213, or about 7 per cent.

The general appearance of Purti was then rather sickly. Mr. Murray thought the soil was in fault. I saw it in 1870, and think clearly that the method of planting and irrigation is in fault; but of this hereafter. Young plants of smaller size, and put in in the spring, answered better; and at the close of 1870 there were not above 6 or 7 per cent. of blanks in any of the three plantations.

I now proceed to offer some remarks on the treatment of deodar. Some of these are necessarily only suggestions, requiring further ascertainment and observation; others seem to me to be sufficiently certain to be acted on. The thing that struck me most about the treatment of Chau and Purti was that it was in almost every respect *dissimilar* to what young seedlings undergo in nature. The Chau plot especially was completely *cleared* before planting. The trees were put at considerable distances apart, at the bottom of a trench, with water flowing over them.

In nature, seedlings are generally found under, and *always prefer, shady cover*, never have water flowing over them, and are invariably close together. I do not say that artificial irrigation may not be necessary in a dry climate like Pangi, but it ought to be strictly regulated, and the trees, I am convinced, ought not to be put at the bottom of a water-trench, but planted on the slope of a ridge formed from the earth thrown out of the trench, or planted between water-courses or trenches set to collect drainage water where the soil is open and easily permeable. The failure of the season 1868-69 at Purti, is, I feel confident, due to the trees having got into an unhealthy state owing to the system of irrigation and to their consequent destruction,—first by drought and then by an excessive flow. I expect also that planting too deep in the soil had a good deal to do with it. With pines especially this has to be avoided, and the older the transplant, the greater the evil. The soil, though sandy, is of a disintegrated schist, containing abundant mica and far from being innutritious. The place was also once covered with trees, and many survivors still show that the fault is not in the soil.

The complete clearance of ground is, I believe, a great mistake, and no plantation ought to be made without efficient shade and protection from sun and cold winds. It is never to be forgotten that there is a vast difference between choking by weeds of rank growth—becoming doubly so with the water channels—and the cover afforded by coppice of oak, hazel, "raus," *cotoneaster*, or even *indigofera*. These should only be partly cut away, so as to secure with the shade a free circulation of air and moisture by a clear upward space between the ground and the spreading branches. Hazel and oak coppice always secure this by the length of the woody stems. This is quite different from rank vegetation, which chokes the place from the surface of the soil and upwards. When I visited Chau I could hardly make my way through a dense tangle of a climbing species of vetch, a *dipsacus*, coarse grass, and a variety of herbaceous plants as high as myself, and obliterating the trees, at their great distance apart, almost entirely. Expense has to be incurred every year in cutting down this stuff. The idea that deodar is prevented from shooting up, and its leader crooked and perverted by having to push its way through branches overhead, is beyond all question a fallacy. Anyone who has seen the luxuriant growth of young deodars, their delicate leader shoot pushing up straight and intact through the branches of oak coppice, at Simla, must at once recognize that the young trees, pretty close together and under thick shade (but not choked close to the surface of the ground), are in their most suitable situation, and rejoicing in it. Open plantations will generally succeed only where the soil is deep and natural moisture considerable, and a shade of trees is effected by natural position all round. On the upper Chenab I would plant trees in "quincunx"* (like the spots on a domino) under some of the hazel coppices, having done a very little thinning and clearing first. The trees should be of the size presently alluded to, the distance not more than 4½ feet apart, and freely

NOTE.—The only objection to this is that the thicket would scarcely admit to penetrate and thin out when arrived at that stage of growth; lines and spaces must therefore be left to give access.

intermixed with pieces *excelsa*. Pot cultivation, from its great cost in the hills and otherwise, does not seem to answer on anything like a large scale. For artificial plantations I would generally make nurseries, in exceptional localities using natural seedbeds, if close at hand. But never transport seedlings for transplants in "kiltas"; the shape of the basket causes all the earth to be removed from the roots, and exposes them to risk of injury.

I would suggest that the preservation of the fine outer skin of the root is of the first importance. Put in a number of small deodars with the root skin abraded, even in a slight degree, and they will surely die,—or live on for a time, the wound not healing, till a beetle larva attacks it. This I expect to be the origin of the cases of death in the Ravi plantations. For this reason, only small plants should be transplanted. It is perfectly certain that transplanting trees as old as four years, or anything like as high as 2 or 3 feet (as I have seen done), always results in a large percentage of failures, and in any but most exceptionally favourable cases of individuals, under excessive care, in a slow and unhealthy growth. The trees soon look yellowish, and the tips of the shoots become a delicate lilac. They then dry a red-brown, and the tree perishes. Healthy seedlings and young trees are always *bluish*, with a bloom like that of a grape on them. My idea is that when we are not able to supervise very closely the working parties, and are not able to adopt the "double nursery system" presently described, the transplants should be not more than four inches high, and should be transplanted in Pangi in the early spring. On the Ravi, transplants during the rainy season do not answer, and spring and autumn transplants seem to succeed best. Natural seedling beds are best utilized by taking them to restore cut-out forests, and to equalize reproduction. It will often be found that the seedlings occur in dense patches, leaving other places bare; also when dead wood and stumps are cleared out of the forest, there will be many places requiring to be filled up; and I believe this method of reproduction to be the most successful, and urge the largest part of reproduction works in each year being done in this way. For plantation nurseries, the following plan is suggested. It is of course necessary either to fence or to select a place where goats and sheep cannot possibly come. Plough it up and work the soil well and deeply, and sow good seed in October (or as late in autumn as the officer stays on the upper river) in the lines and cover over. It requires no water, because snow melting in the spring effects all that is wanted for the shooting forth of the seedlings. Leave till October following, when the snow will again fall on the young seedlings. Two methods can now be followed. One is as follows:—In the spring following (thus 2nd October) dig out with a spade one, two, or even three in a cluster, earth and all. The spade should be narrow-bladed, the lower edge being only six inches broad. The shorter distance the plants have to be carried the better; but do it in flat baskets or boxes—*never* in "kiltas." Put the little cluster into your plantation holes, which should be not more than 4½ feet apart. I have already observed about irrigation. The other method is what I first called the "double nursery system" (Germ. *Einzel pflanzung*). By this, *single* plants are taken, as before, out of the nursery (they will be about 4 inches high), and are thence separately put into a second nursery for the purpose of strengthening them. From this second nursery the single and well-grown plants—after a year they will be 10-12 inches high—are put out into their ultimate position. This system is now much better thought of, after many years of experiment, than the first, and every careful officer will do a good deal of his planting by this method. The first system is, however, economical, and with the rough sort of labour at command, and the difficulty of always seeing each plant put in, it is perhaps less liable to cause failure by injury to the plants. It should be remembered that the remarks as to moisture, &c., apply to Pangi, where we have no regular rainy season beyond showers, occasionally heavy. Shade, therefore, and every means of husbanding natural moisture in the soil are of first-rate importance. In conclusion, the great is to *imitate nature* throughout as regards season of seed-fall and sowing, the effect of snow, and the position as regards shade, moisture, and subsequent growth. I am perfectly confident above all that it is best to plant close and thin out afterwards, and that the smaller the transplant, within the conditions above indicated, the greater its chance. The artificial reproduction of *P. excelsa* and ash (sumnoo) should always be kept in mind on the upper Chenab.

A general review of the prospects of the upper Chenab seems to lead to the conclusion that natural reproduction is taking place with perfect success in favourable localities; that this may be relied on as the mainstay; and that efficient protection is all that is necessary. The work that ought to attract the most of our attention for the next few years is the equalizing of reproduction over the whole of cut-out forests, by filling up blanks and dibbling in seed in the autumn. Work in new plantations should be concentrated, and I think no places is better situated than the Bara Bamal region on the right bank, and the opposite slopes on the left. Accordingly on the right bank the Kanun forest might be taken up at an early date; then take Bamal and the Chau plantation extension. I should leave the rest till these are thoroughly done. On the left bank I should be inclined to take up Nos. vii., viii. and ix. The remarkable level piece between Barantal and the Brakuai should be taken up afterwards.

FORESTS AND WATER-SUPPLY OF ALGERIA.

(*From the Revue des Eaux et Forêts for September 1870.*)

BEFORE concluding the article which appeared in the number for February last, on the mountain-system and distribution of the forests of Algeria, I think it will be useful to reproduce the following passage taken from an article published by M. Jules Duval in the *Economiste Français*. It is impossible to set forth in a more striking manner the importance of the forests of our splendid African colony:—

"Owing to its situation between the 33rd and 37th degrees of north latitude, and its proximity to that great reservoir of torrid heat, the desert of Sahara, Algeria is constantly exposed to burning winds from the south and to prolonged droughts. The greatest risk is incurred by the Province of Oran, which is closest to the zone of the desert, owing to the obliquity of its littoral; the risk is less in the Province of Algiers, which is better sheltered by the mountains on the south; and is greatly lessened in the Province of Constantine, which is further removed from the fiery furnace of the desert, and better defended by the elevated barrier of Mount Auros, the surface being also more uneven and diversified by the spurs and peaks which radiate in every direction from the chain of the Atlas. As the effect of its geographical position, drought is the normal condition of Algeria—absolute drought during the six months of the summer, and dryness more or less prolonged even during the six winter months. The colonists talk commonly (almost every year) of exceptional droughts. They delude themselves; the only thing exceptional is abundant moisture.

"This dryness, however, so far from being absolute, is mitigated by the winter rains which go from west to east, increasing in intensity as they go: rather rare at Oran, these rains are frequent at Constantine and Bona. During the rains the average fall closely approaches that of France, and sometimes exceeds it; but the rains are almost altogether confined to the winter months—from October to March.

"Such, in its general characteristics, is the law of the climate of Algeria—a fixed, invincible law, which has its advantages along with its inconveniences, and which must be managed with intelligence, under pain of being defeated by it. This law is familiar to the southern races (for the climates of all the Mediterranean shores are very much alike), but it has never been understood by the administrators of the north of Europe, among others by those who live in Paris, where excessive humidity is the habitual character of the climate. Hence very grave mistakes.

"The economic consequences of this supreme law are in effect there:

"Since there is always a risk in Algeria of failure of the water supply for agriculture, intelligent cultivation and policy should unite in the application of their entire force to utilize all the water which falls from the clouds, which flows over the earth, and which penetrates the soil. Since rain falls only in winter and is altogether absent in summer, the excess of the winter fall should be preserved for the necessities of the summer. Every influence favourable to atmospheric humidity should be developed by natural methods, *viz.*, by the conservation of existing woods and the planting out of others. The pasturing of cattle in the woodlands, which involves the destruction of the young trees, should be forbidden or checked with vigilant severity, at any rate on the highlands: means should be taken to prevent (or at least to punish the originators of) the fires which ravage the forests—profound forests which formerly nurtured the elephants destined for the Roman circus.

"In one word, successful administration in Algeria, as in all Northern Africa, in Morocco, Tunis, and Egypt, as well as in Greece and Italy, and the South of France and of Spain, hinges mainly, so far as the promotion of the physical welfare of the inhabitants is concerned, on an intelligent and careful utilization of the water-supply. Water, more water, and more water still, such is the pivot on which agriculture in these countries turns even more than on railways. Allied with heat, water endows the soil with prodigious fertility, while, on the other hand, soil of the best composition remains sterile without irrigation.

"This principle of public well-being required the construction on every water-course in Algeria of dams flanked by canals: yet, after an occupation of 37 years, there is but one in full work, on the Sig, which will endow with more lasting honour

the memory of General Lamoricière than any of the battles to which he owed his military glory. A hundred other rivers, water-courses, or torrents, should have been thus dammed to ensure the harvests of a hundred plains. Nothing of the kind has been thought of, or, if thought of, nothing has been done. There has been a greater inclination to spend money in surrounding with fortifications the smallest village in the interior, and on the first opportunity of setting loose the dogs of war. Yet what a difference there is, even as regards the pacification of the country, between the effect of rifles and cannon, harrying and burning, and the effect of dams and canals, fountains and ponds, which would have enriched the natives as well as the colonists. The district of Biskra, in which alone what we call the *hydraulic policy* has prevailed, tells the tale of the virtues of artesian wells.

"Not only have streams of liquid gold and silver been allowed to run down to the sea, but Arab cattle and Arab fires have been allowed to devastate the forests, *i. e.*, to increase the natural dryness of the country; and when the Forest Department, understanding and doing its duty, endeavoured to repress these abuses, it was accused of odious interference with native customs: when just sentences were pronounced against the incendiaries, they were freely remitted as an act of grace. Following on this, Algeria was divided into longitudinal zones, which, for purposes of surveillance, separate the heads of the rivers in the south from their courses and termination towards the north. Thus, the forests, those precious sources of humidity, have everywhere, notwithstanding the wishes of Councils-General and in spite of the protests of the press, been more and more abandoned to devastation. The Arabs have reaped famine and drought as the result of scattering cattle and fire through the woods, a fatal expiation which, following the laws of universal order, creates evil, from evil as it brings forth good from good."

The agricultural future of Algeria depends upon the conservation of existing forests and the reproduction of those which have disappeared. This is a truth which is instinctively accepted, but has not yet been scientifically demonstrated. We shall endeavour to do this here, and to prove that the regulation of the water-supply is intimately connected with the condition of forest vegetation.

Northerly winds prevail on the whole African coast. The resultant average corresponds to N. N. W. In consequence of the position of the Mediterranean between France and Algeria, and under the regular play of the atmospheric currents, it happens that the same wind which keeps the sky perfectly clear on the southern coasts of France, brings rain to the opposite shores. This fact explains how certain years of drought in France correspond to years of fertility in Algeria.

The rainy season is comprised between the two equinoxes, from the month of October to the month of March. It is probable that if there where no mountains on the coast, Algeria would be as rainless as Egypt. In ancient times, the Greeks and Phœnicians attributed the inundation of the Nile to the northerly winds or etesians, which, by a supposed pressure, arrested the course of the river. Democritus, however, guessed the true cause (Diodorus Siculus, lib. ii) He says, in effect, that the inundations of the Nile are occasioned by the rains which fall in Abyssinia and the adjacent parts of Africa under the action of the northerly winds driving the clouds towards the south, where *they are arrested by the mountains.*

The distribution of the rains between the three provinces of Algeria is proportioned to the relative elevation of each. It has been proved that on the average twice as much rain falls in the Province of Algiers as in Oran, and three times as much as in Constantine. The belt of shore from the great Kabylia as far as Tunis, is exceptionally privileged. It often happens that the rain-fall is confined to a belt of country not extending further than 15 leagues from the sea-shore.

The rain generally comes in storms. The result is that a considerable mass of water is accumulated on the surface of the soil, which, instead of being absorbed, flows off rapidly. Nobody has travelled in Algeria during the rainy season without having witnessed some of those sudden floods which rush down the torrent beds in one mass, and with such rapidity that herds and even men are sometimes overwhelmed before they have time to escape. In denuded regions the smallest hollows in the earth are transformed in a moment into torrents which, directly the rain has ceased, disappear as rapidly as they formed.

The mountainous regions where the forests have been preserved, present a totally different aspect. The rivers rise and sometimes overflow in the lowlands, it is true; but the rise is gradual, not sudden and with a rush. It may be added that in many cases the inundations are caused by a heavy sea at the mouth of the river barring the current of the river and preventing the water from flowing off.

The fact of the rains being confined to a fixed period, to the almost entire exclusion of the remainder of the year, and the violence of the showers, demonstrate the important advantages which would result from having certain places of reception to contain the waters and prevent inundations.

The surest means, as shown by M. Jules Duval, of attaining this double end, are the conservation of the forests and the construction of dams.

The forests act in two ways,—as agents of absorption, and as agents of evaporation.

I have not to consider here the faculty possessed, more or less, by forests of retaining rain-water for the supply of springs. Such an important subject cannot be treated incidentally. I prefer referring my readers to the very remarkable articles on this question by MM. Marie-Davy and A. Mangin, published in the September, October, and November numbers last year.

Moreover, I think that in such matters there can be no absolute certainty. For instance, I will readily admit with M. Marie-Davy that on a plain or a gentle slope, an uncovered and especially a light soil should absorb a larger quantity of water than a wooded soil, which will be less cut up, and the surface of which commences by taking up to saturation all the water it can retain. But in proportion as the slope becomes steeper, the conditions change: for a certain quantity of water falling in a given time, absorption depends not only on the degree of *absolute* or *specific* permeability of the soil, but also on the rapidity with which it flows along the surface, this rapidity being proportionate to the volume. In this point of view, therefore, forests, by dividing the currents of the water, and thus opposing a resistance to the flow, offer certain more favourable conditions of absorption. The greater the slope, the more considerable is this advantage over unwooded soil. Lastly, there is a degree, unhappily but too well-known, where such unwooded soil can offer no resistance to the movement of the mass of water, and is washed away. The advantage—I will even say the necessity—of forests in such conditions is unquestionable: well, this is in general the case with all the Algerian forests.

In Algeria the influence of the forests upon the regulation of the waters is shown, therefore, perhaps more than anywhere else, in two kinds of useful effects,—they retain, in the first place, for the benefits of the springs, a part of the water which, without them, would be drawn down with the vegetable mould into the valleys, and, moreover, by retarding the flow over the surface of the soil, they moderate the rapidity of the rise of the water and diminish the dangers of the floods.

This, however, is not their only influence. They exercise along with this, another not less considerable and not less useful influence upon climate by the continual evaporation which they spread through the atmosphere.

Are we, in fact, to see nothing in the evaporation caused by trees but a cause of complaint against the forests, inasmuch as they expend for their own advantage and apparently merely to satisfy the necessities of their existence a part of the water stored in the depths of the soil? If the result were such that all the humidity was absorbed by the forest, and that no excess moisture could find its way to the surface of the soil, the charge would become serious; but the experience of every day proves, on the contrary, that water springs are found specially in wooded regions. And after all, even if it were demonstrated that forests, instead of protecting water-sources, are causes of their impoverishment, which my experience, as a forester, will not allow me to admit, it would remain, at any rate, to be considered whether it is not preferable that a part of the water of the soil should be spread through the atmosphere in the form of vapour to temper the excessive heats of certain climates. It suffices for this purpose to pass in review the countries afflicted at the present day with dryness, and it will be seen that the regions where there is an absence on wood are those which suffer most.

Herbaceous plants possess, it is true, in a higher degree than trees, this power of vaporization, but they cannot apply this power and live except with the aid of the water contained in the thin layer of soil accessible to their roots, and, as surface-water lasts *only for a time*, their action is limited to the period of their brief existence which terminates with the first breath of the southerly wind. The forests then can alone be relied upon as permanent agents of vaporization during the excessive heats of the summer.

The preceding considerations bring me naturally to another train of ideas.

As yet I have shown Algeria as she has been and not Algeria as she should be. In speaking of her forests, my intention has not been to turn to their advantage alone the interest and the merit of a solution. I have endeavoured merely to prove that in their existing conditions, they are not only useful but indispensable auxiliaries which ought to be protected against improper devastation and the traditional practice of firing. But this is only a partial solution of the great problem to be solved in Algeria. It is not enough to preserve the forests; the plains must also be utilized. What is wanted for this? Water. And to obtain water? Dams.

Who does not see at once the prodigious impulse these

works would give to agriculture? The cultivation of cotton* and the creation of artificial meadows could then be seriously taken into consideration. Has any attempt been made to calculate the quantity of forage which Algeria could have furnished to France during the years of drought through which we are passing, if her plains were properly irrigated?

Leaving aside, however, this economic aspect of the question, let us consider only the immediate influence which would be exercised upon the climate by these new methods of utilising the soil.

I think it will be sufficient to call to mind a very interesting experiment cited by M. Marié-Davy in his article published in the *Revue* of the 10th September last. The learned professor remarked that, in a single day in July, a belt of turf vaporised 5k. 79 of water per square metre, equal to a height of 0m. 00579. "If the same evaporation," he said, "were produced over the entire surface of the soil during the whole of the year, the heat consumed in the operation would be equal to that which would be absorbed in the melting of a layer of ice about 15 metres thick. It is almost the half of the heat we receive annually from the sun, according to the calculations of M. Pouillet. The influence of evaporation upon climates can thus be appreciated."

It is shown also from meteorological observations taken in the Isthmus of Suez and discussed by M. Rayet, that the waters of the canal have modified the climatic conditions of the regions they traverse, by lowering the temperature, and sensibly increasing the number of rainy days.

I am satisfied to rest my case upon these quotations. They demonstrate conclusively the point I had to establish, and the necessity of the works so urgently demanded by all intelligent persons interested in the future of Algeria.

Special care should be taken that the exceptionally favourable circumstances in which the harvests in Algeria present themselves this year, do not cause the misfortunes and disasters of the preceding years to be forgotten. Algeria benefits by the atmospheric reaction caused by the dryness prevailing in France; but generally the contrary is the case. Here, unless I deceived myself, is a sort of equilibrium worthy of consideration.

I will add, in conclusion, that no enterprise will be more popular with the natives than works for the regulation of the water-supply. We have nothing to teach the Kàbyles in regard to irrigation: the waters of their mountains are admirably utilized. If the Arab has as yet appeared less anxious in regard to these improvements, he is not to be blamed so much as the conditions of tenure among the tribes; for the Arab, on the contrary, has a sort of veneration for water. In his eyes there are three things in the world which make the happiness of the true believer,—beauty, verdure, and the good which flows. Water, he says, issues from Paradise; it is the source and symbol of happiness.† This is very poetic, but the Arab will never occupy himself in the amelioration of his ground by serious works as long as he is not sure of retaining it. It is in this way that all the various questions connected with Algeria are linked together, and that finally the solution of the majority of the questions is found to be connected with the fundamental principle of the creation of individual, instead of tribal, tenure of property. In fact, this principle is now the conviction of all practical men interested in Algeria, and it has been made the starting point of the reforms which have just been promulgated.—*Gazette of India.*

* See M. Louis Reybaud's article in the *Revue des Deux Mondes*, liv. iii., tom. iii., 1861.

† See *Vie arabe et la Société Musulmane*, par le General Daumas, 1869.

Official Gazette.

BOMBAY, 21st NOVEMBER 1871.

EXPERIMENTAL FARM—MADRAS.

ANNUAL REPORT OF THE MANAGEMENT OF THE GOVERNMENT FARM ESTATE, FOR THE YEAR ENDING 31st MARCH 1871.

(Continued from our last.)

Effects of Cultivation.

THERE is a marked change in the appearance of our soils. Soils which when reclaimed only two years ago could scarcely rear a blade of grass, and consisted almost entirely of blowing sands, might now, as far as appearance goes, be classed as fair arable soils. Much of this is certainly due to heavy dressings of tank mud and burnt earth; still, I think, much more is due to deep cultivation and the liberal use of foldyard manure. The mere cultivation of a sand, that is the mere stirring of its particles, will do little to improve it; it is only when combined with manure that any real good results. On a good arable soil superficial culture with imperfect implements and without manure continued for a time, will exhaust the upper few inches of the soil; still, by cultivating deeper and by using better-constructed tools, it is always within the means of the cultivator to bring up to the surface a portion of the lower or less exhausted soil, and thus restore, in a measure, the fertility of his land; but the cultivator whose soil consists of sand resting on a sandy sub-soil which is even poorer and more hungry than the upper soil, cannot effect any good in this manner. In his case deep cultivation without manure will only make matters worse. The cultivator of a sandy soil such as this must put into his soil the food on which his crop must feed. He has the manufactory and the manufacturing appliances, but he needs the raw material for manufacture. The phosphoric acid, the lime, the potash, &c., must be put into the soil before plants needing these foods can be profitably cultivated. But this is not all; he must endeavour to alter the physical state of his soil, so as to lessen the evil effects of droughts and heavy falls of rain which alike act so injuriously on very sandy soils. But it is useless to attempt, by a single operation, to fertilise a barren soil. Such an attempt would end in a great waste of money. The work of improvement requires time, and it can only be effected in stages.

Our plan has been to apply a slight dressing of manure to *each* crop, and to crop the land as frequently as possible with green crops. These crops, being cut in the green state, leave a great quantity of roots, &c., in the ground, and add greatly to the quantity of organic matter in the soil. True, we might have effected this more quickly by ploughing in the green crop, but the stock-feeder, on land like this, has seldom such a superfluity of green food as to justify this procedure. Another improvement, which has greatly benefited our land, is the open drains which have been laid out in different directions for carrying off surplus water during the rains. The more I see of dry land farming in this country, the more am I convinced that our crops suffer more from *too much* water than from *too little*. Water, in a stagnant condition, is more injurious than a drought. A drought may only affect one crop, but stagnant water in the land may affect many crops. Deep cultivation, with proper manuring, has greatly increased the capillary action and absorptive powers of our soil. Crops on this farm continue fresh and green long after the crops on neighbouring farms are scorched and dried.

The usual system of dry land management in this district which allows of crop after crop being taken off the land without a particle of foldyard manure being used, and is content if the cultivation of the soil is confined to a surface-stirring not over three inches in depth, is most suicidal. The great object of the cultivator of dry land should be to enable his soil to retain as much water as possible without its being stagnant or being actually visible to the eye. He should take care that no water remains on the surface of the land, and by deep ploughing and the liberal use of organic manures increase, as much as possible, the porosity of his soil; instead of this, the result of his operations is that his soil is rendered as little porous as possible; his lands during the rains are flooded and swampy, while, during the dry weather, they are baked and cracked. A soil which only contains twenty per cent. of water may be wet and swampy, while another which contains as much as thirty per cent. may appear much the driest. During very dry weather the crops on the former will suffer greatly, while on the latter the crop may thrive and suffer little.

Implements and Machines.

The large water-lift was taken to pieces, the elevator was sold to the Madras Municipality, and the shafting and gearing was returned to the Public Works Stores. The wind-mill and pump, the paddy-huller, the bone-crusher and the rotary screen have been transferred to the Public Works Department. A quantity of costly English agricultural machinery was received from the Oossoor Farm in September last, the details are as follows:—

3 Large corn drills.	2 Horse gears.
4 Winnowing machines.	2 Reaping machines.
2 Threshing machines.	

The winnowing machines, one of the threshing machines, and a reaping machine, can be utilized; but the remainder of machinery is useless here, and I fear useless in the present condition of Indian agriculture. Several of these machines are excessively heavy and cumbrous. Where labour is costly, these machines may be utilized; but they are useless to the Indian ryot in his present circumstances. If it will not pay to export them, there seems to me no other alternative than to take them to pieces and use them up in constructing simpler machines. It is very undesirable that any of these machines should be sold amongst Indian ryots; should any wealthy cultivator be sufficiently enterprising to purchase any of them, the experiment could only end in failure, and be more productive of harm than of good. The

following is the list of machines, &c., sold during the twelve months, and the districts into which they were sent :—

	Districts.		Districts.
2 Reaping knives	Tanjore.	1 Iron plough	Rajahmundry.
1 Iron plough	North Arcot.	1 Iron plough	Tanjore.
2 Chaff-cutters	North Arcot.	1 Water-lift	Madras.
1 Maize-sheller	North Arcot.	1 Iron grubber	Coimbatore.
25 Reaping knives	Neilgherries.	1 Norwegian harrow	Coimbatore.
1 Cake-crusher	Neilgherries.	2 Iron ploughs	Coimbatore.
5 Reaping knives	Madras.	12 Grass knives	Madras.
1 Iron plough	North Arcot.	1 Iron plough	Madras.
1 Chaff-cutter	North Arcot.	1 Maize-sheller	Coimbatore.
1 Reaping knife	Coimbatore.	1 Iron plough	Coimbatore.
1 Hand hoe	Coimbatore.	1 Iron cultivator	Coimbatore.
2 Scythes	Madras.	2 Wheel-barrows	Madras.
2 Iron wheel-ploughs	Coimbatore.	2 Grass knives	Coimbatore.
1 Set of iron harrows	Coimbatore.	1 Water-lift	Ganjam.
1 Iron swing-plough	Coimbatore.	1 Water-lift	Bombay.
1 Chaff-cutter	Madras.		

Many of these were purchased as patterns from which others could be made by the native smiths and carpenters of the district.

A special grant of 1,500 rupees was made to the farm on the 26th March 1868, for the purpose of keeping up a stock of implements and machines for sale. Under these arrangements fourteen ploughs, one-and-a-half set of harrows, two water-lifts, three maize-shellers, and six chaff-cutters, have been disposed of in the Presidency. At the present time we have stock on hand worth rupees 180, a balance of rupees 1,061-14-5 in cash, and have advanced rupees 265-3-1 to an American Firm for agricultural machines, making a total amounting to rupees 1,507-1-6. The details of income and expenditure under this head will be found in the Appendix.

An implement workshop was commenced about three months ago. In it three carpenters and three smiths are employed in making ploughs, harrows, carts, winnowing machines, wheel-barrows, seed-drills, scythe-blades, grass-knives, &c., for sale, besides executing all repairs needed either on account of these farms or the general public. We have long felt the need of some such establishment. It was almost impossible to get repairs executed, and there was always a great waste of time and a heavy bill to pay. English implements, being made for horse-power generally, need to be altered before they are suited for cattle-power, and for the very primitive mode of yoking adopted here. These alterations could not be satisfactorily performed by men who had no knowledge of the practical working of these implements. Besides our experience in the field is constantly suggesting modifications in the working parts which could only be executed on the spot. We now have facilities to experiment with a view to determine the shape or description of implement best suited to the peculiar circumstances of the Indian ryot, and last, but not least, we can prove to the Indian cultivator that his local smith and carpenter can make up or repair any of our most useful agricultural implements. In the manufacture of implements and tools we use no castings of any sort, and thus remove one of the chief objections urged by many ryots against our English implements. The iron parts being all of wrought iron, repairs can be easily executed by any native smith. Iron castings, though cheap and effective, are a nuisance in a country where castings cannot be made. The unfortunate cultivator, whose implement is laid aside because a casting is broken, often has to choose between either abandoning the implement altogether, or spending as much as it is worth in conveying it to and from the nearest town in which the casting can be done, while he is put to a great deal of trouble and inconvenience. The accounts of these workshops are kept separately. The establishment will be self-supporting: no profit is sought; only the actual cost of the implement, plus five per cent. to meet contingencies; the sole object being to introduce a better class of implements and tools amongst the ryots. During the three months this establishment has been in existence, we have expended as follows :—

	Rs.	a.	p.
Workshop buildings	357	12	9
Plant	140	4	0
Materials and labour	617	13	0
Machines	874	12	0
	1,990	9	9

and we have received—

Loan from Experimental Farm as Capital	363	1	3
For machines, &c.	875	0	0
Materials and labour	231	15	6
	1,990	9	9

Liabilities.

Experimental Farm Loan	883	2	3
Out-standing bills	110	3	4
	993	6	7

Assets on 31st March 1871.

Buildings	357	12	9
Plant	140	4	0
Machinery, &c.	140	4	0
Stock on hand	180	14	0
Out-standing bills	110	14	3
Loss	47	13	10
	993	6	7

Five per cent. is charged on the capital invested.

The deficiency of rupees 47 arose, I think, in the cross transactions between the Experimental Farm and the workshops at the commencement of this new establishment, when the plant of the former establishment was taken over at a valuation. And doubtless many little odds and ends, consequent on the starting of a new establishment, were lost sight of in valuing the assets.

Ploughs and Ploughing.

The ploughs chiefly used here are those made by Messrs. Ransome and Sims of Ipswich, and Messrs. Howard and Co. of Bedford. Most of those are single-horse or pony-ploughs. Those by Messrs. Howard and Co. are made of iron; they weigh eighty-five pounds, and seem well suited for light soils. They cost about 35 rupees each delivered here. One of these ploughs, on a free sandy loam, gave the following results when tested by the dynamometer :—

Complete with Wheel and Coulter.

	lbs.
Ploughing a furrow 4 inches deep and 8 inches wide	168
Ploughing a furrow 6 inches deep and 9 inches wide	263

Without a Coulter.

	lbs.
Ploughing a furrow 4 inches deep and 8 inches wide	156
Ploughing a furrow 6 inches deep and 9 inches wide	205

Without either Wheel or Coulter.

	lbs.
Ploughing a furrow 4 inches deep and 8 inches wide	320
Ploughing a furrow 6 inches deep and 9 inches wide	356

When drawn along an empty furrow the dynamometer registered fifty-six pounds.

Thus the actual draught of one of these ploughs, when ploughing a furrow four inches deep and eight inches wide, is only 168 pounds; of this fifty-six pounds, or about thirty-three per cent., is due to the weight of the implement.

When used without the wheel as a "swing" plough, the draught was increased sixty-six per cent. Ransome and Sims' ploughs have long been used on this farm. The light iron ploughs made by this Firm are very similar to those sent out by Messrs. Howard and Co., and do their work in an equally satisfactory manner. We have found one of their large ploughs—The Newcastle—very useful during dry weather, when the light plough would not penetrate the ground. This plough weighs 200 pounds, and though much too heavy for ordinary work, is nevertheless very useful under the circumstances just described. With this plough the dynamometer gave the following results :—

Complete with Wheel and Coulter.

	lbs.
Ploughing a furrow 4 inches deep and 10 inches wide	273
Ploughing a furrow 6 inches deep and 10 inches wide	398

Without a Coulter.

	lbs.
Ploughing a furrow 4 inches deep and 10 inches wide	290
Ploughing a furrow 6 inches deep and 10 inches wide	406

Without a Wheel or Coulter.

	lbs.
Ploughing a furrow 4 inches deep and 10 inches wide	336
Ploughing a furrow 6 inches deep and 10 inches wide	507

Complete.

	lbs.
Running in an empty furrow	113

Thus, when ploughing with a furrow four inches deep and ten inches wide, forty-five per cent. of the draught registered is due to the weight of the implement. A combined plough, that is one made of wood and iron, which was made on the farm, was tested in the field in which the iron ploughs were worked, with the following results :—

	lbs.
Ploughing a furrow 4 inches deep and 8 inches wide	182
Ploughing a furrow 6 inches deep and 9 inches wide	290
Running in an empty furrow	65

Thus thirty-two per cent. of the draught registered is due to the weight of the plough. It is a swing-plough with wooden stilts and pole, and the whole of the iron-work mould-board included, consists of malleable iron. We thus avoid the loss and annoyance the breakage of castings so frequently causes. Wherever there is a village smith, the plough can be made up or repaired. This plough only weighs seventy pounds, and can be conveniently carried from field to field, and it is so constructed that the driver, while working, is always close to his cattle. To plough an acre of land six inches deep and nine inches wide with one of these ploughs, the cattle will have to travel eleven miles, and the plough will raise and turn over 369 cubic yards of earth

in the operation. An ordinary native plough was tested in the same field; the following is the result:—

Ploughing 8 inches deep and 6 inches wide at the surface of ground, and one inch wide at bottom of furrow	140 lbs.

To plough an acre of land with this plough, the cattle will have to travel seventeen miles, while only 400 cubic yards of earth will be turned over. The foregoing experiments prove that one of these combined ploughs will, in ploughing an acre of land, turn over nearly 900 cubic yards of earth, while the cattle will only have to travel eleven miles, and will exercise a traction force equal to 280 pounds. A native plough will only require half this draught, though it will have to travel seventeen miles to plough an acre, and will only turn over 400 cubic yards of earth. The native plough cuts out a triangular furrow, while the furrow made by the English plough is rectangular. The result is that while the English plough cleans out its furrow and leaves the undersurface level, the native plough leaves a ridged undersurface nearly half of the land being unploughed. Again the English plough inverts the soil and brings up each time a fresh surface, while the native plough or cultivator, as it should be called, leaves the soil in its original position. It may be contended that as the native plough only does half of the work, and only needs half of the traction force required by the English plough, the ryot has only to pass his plough twice through his land to do the work of an English plough; but this is not the case; it will be necessary for him to plough his land over *several* times before it is in the state in which it is left by the English plough. Besides, there are several agricultural operations which the native plough, in its present shape, never can perform. And again, one English plough, with one man and an average sized pair of cattle, will do the work of two native ploughs, two men, and two pairs of cattle. Thus, the ryot for each English plough he uses, can dispense with the services of one plough-man and one pair of cattle. True, he may have to keep his cattle a little better than at present, but this will be money well expended. I may here remark that these deductions founded, as they are, on experiments made on a particular class of soil, can have no bearing whatever on soils of a different character. The cost of an English plough need not now create any apprehension in the mind of the ryot. The combined plough I have just been comparing with the native plough was made on this farm, and only cost 15 rupees; indeed we are making them up at this price; a ryot, with his own wood and cheap labour, could probably make them up at 10 or 12 rupees each. These combined ploughs are as well suited for wet cultivation as for dry cultivation. Indeed I am acquainted with no plough so well suited for paddy cultivation. I have tried several forms of the native plough, and have even tried one with a mould-board added, but none worked so satisfactorily. One of these combined ploughs, when ploughing in puddle for paddy, gave the following results:—

	Draught.
Ploughing a furrow 6 inches deep and 9 inches wide	166 lbs.

While the native plough gave the following results:—

Ploughing a furrow 6 inches deep and 6 inches wide at surface, and 3 inches wide at the bottom of the furrow ...	70 ,,

The very defective construction of the native plough adds *very* greatly to its draught. Thus, in the hinder part of the plough there is a flat surface measuring eight or ten inches placed at right angle to the line of draught; this not only offers a great deal of resistance in the passage of the plough through the soil, but in wet land such an amount of mud collects on it and in the angle below the pole, that the plough is drawn through the land with great difficulty. This is not the case with ploughs provided with English-shaped mould-boards; these mould-boards offer no points for the accumulation of mud, and the plough cleans itself as it proceeds. A ploughing match was held on the farm last season amongst the native ploughmen. All used English ploughs of the Messrs. Howards' or Messrs. Ransomes' make. The soil was a light sandy loam. Each of the plots contained 1,000 square yards. The following are the results:—

	Minutes.
1st man ploughed his plot in	81
2nd do. do.	92
3rd do. do.	99
4th do. do.	108
5th do. do.	109
6th do. do.	127

The land worked very freely, and the work was done early in the morning. The average width of the furrow was nine inches, and the depth between five and six inches. The work was performed in a very satisfactory manner.

Dynamometer Tests.

The dynamometer has been of great value during my recent investigations into the relative capabilities of certain agricultural implements. Amongst many others the following results were obtained:—

Iron Harrows.

Dead weight	84 lbs.
Breadth	7 feet.
Draught	288 lbs.

Iron Harrows.

Dead weight	68 lbs.
Breadth	4½ feet.
Draught	160 lbs.

Wood Cultivator.

Dead weight	80 lbs.
Breadth	27 inches.
Draught when cultivating 3 inches deep...	260 lbs.

Iron Drill Cultivator.

Dead weight	90 lbs.
Breadth	17 inches.
Draught when cultivating 3 inches deep...	210 lbs.

A Country Cart.

Dead weight	900 lbs.
Draught when drawn along a good level road empty...	42 ,,
Draught when drawn along a good level road with a load of 400 bricks weighing 1,600 pounds	84 ,,
The same when drawn along an ungravelled road similar to the sidings on the roads in this district ...	350 ,,

A Cart built on the English Plan.

Dead weight	1,074 lbs.
Draught when drawn along a good level road empty.	50 ,,
Draught when drawn along a good level road with a load of 400 bricks weighing 1,600 pounds	135 ,,
The same when drawn along an ungravelled road similar to the sidings on the roads in this district ...	336 ,,

Overseer.

The Overseer alluded to in last report has left the farm. Mr. F. Wilkins, who, as an Apprentice, had been employed for some time, was then appointed Overseer. He held the appointment until the first week in July, when he was appointed Overseer on the Model Farm, and was succeeded by Mr. J. G. Young, who also had received an agricultural training on the farm. Though not so well up in agriculture as Overseer Wilkins, he nevertheless has managed very satisfactorily, and promises, with more experience, to make an excellent Overseer. His practical knowledge of mechanics has been turned to good account in the implement workshops. He is a good Accountant, and has been of great assistance to me.

Ploughmen and Labourers.

The skill of our ploughmen is greatly improved; many of them can now handle their ploughs in a very creditable manner. They understand their construction, and can adjust them to the work they are called upon to do. They can also work the reaping machine, the threshing machine, and other agricultural machines and implements generally used here.

During the past year we have had a number of ploughmen under training; amongst others the following Noblemen and Gentlemen sent men to be trained:—

The Maha Rajah of Vizianagram,	The Zemindar of Ramnad, and
The Rajah of Venkatagherry,	The Jaghirdar of Arnee.
The Zemindar of Kalastry,	

Some of the men remained six months on the farm, while others a shorter period. This is a very satisfactory movement and worth every encouragement. The field labourers are also becoming more skilful; many of them can handle a digging fork or a dung fork very satisfactorily, and some can use the hedge knife, the sheep shears, and the shovel as well as any English farm labourer. Their attendance is more regular, and they evince a greater readiness to do work which before was considered detrimental to their caste.

Seed Distribution.

The following quantities of agricultural seeds were distributed gratuitously during the past year:—

	lbs.
Carolina paddy	11,203
Maize	1,338
Chinese sugar-cane	180
Yellow cholum	412

The farm paid all the expenses incurred in picking the seed, and also, in most instances, the cost of conveying it to its destination. The seeds were distributed in nearly every Collectorate in this Presidency. Instructions for the guidance of experimenters were issued along with the seeds, whenever such information was needed. There now remains in the granary, available for distribution, the following quantities of seeds:—

	lbs.
Carolina paddy	1,[illegible]
Maize	[illegible]
Chinese sugar-cane	[illegible]
Yellow cholum	1,[illegible]

The Appendix contains a detailed list in which is recorded the localities in which the seed was distributed.

REPORT ON THE ESTABLISHMENT OF A MODEL FARM ON THE GOVERNMENT FARM ESTATE.

THE northern portion of the estate which, since the Committee took charge of the property has always been rented by small tenants, was, in the early part of July last, set apart for the purposes of a Model Farm. The condition of the land was very unsatisfactory; the greater portion was over-grown with weeds and bushes, and a very considerable area had been appropriated by the public. Not only was the appearance of the land very discreditable; but, owing to the great amount of trespass caused, it was a nuisance to the neighbouring Experimental Farm. At no time had the rents been regularly paid; but it had become very difficult to collect even a very small proportion. It was in vain that large remissions had been made; the renters were men of very small means, and several were without any agricultural training.

Most of them held under a five-years' lease, two years of which were unexpired. During the early part of last year several of them petitioned to be allowed to relinquish their land; but it was not until the month of July when a general petition was received from all the tenants, that, seeing no other chance of bettering matters, it was determined to write off all arrears, and to take the land into our own management.

Area.

The total area thus set apart for a Model Farm is 115 acres, of this area seven acres is occupied by the nullah, roads, buildings, &c. It is bounded on the north by the Cutchcherry compound, on the west by the Mount Road and the Roshanbaugh village, on the south by the nullha and Commissariat slaughter-ground, and on the east by the river Adyar.

Soils, &c.

Nearly thirty acres can be irrigated; twenty acres from the Mambalam tank by gravitation, and the remainder from the wells by picottahs, &c. The soils on this part of the farm differ very little, the majority consists of sandy loams, varying in colour from a yellow to a reddish brown. The dry soils differ greatly: about thirty acres is a blowing sand of the lowest type; about forty acres is a sandy loam of fair quality, free and easy to work, but in a very impoverished state; the remainder is a stiffish loam, with good deal of clay in its composition and a considerable amount of the red oxide of iron.

Rent.

To put the undertaking on a thoroughly commercial footing it was determined to fix the rent at the average yearly income of the previous four years, and to deduct the annual value of the fruit trees which had to be removed to facilitate the work of reclamation. The average income of these four years was found to be Rupees 535. The sale of the fruit-tree timber realized 2,721 rupees, and its annual value was estimated to be rupees 150. This deducted from rupees 535 leaves Rs. 385, the annual rent of the land. In addition to the land-rent there is rent charge on the capital expended by the landlord on improvements; this is assessed at 7½ per cent. per annum, and will be repaid over 24 years. The total amount expended on landlord's improvements amounts to rupees 3,522-11-2; with the cost of some works yet to be done, the total will probably reach rupees 3,800, this at 7½ per cent. per annum will make a rent charge of rupees 285, or with the land-rent a gross rental amounting to rupees 670. But in addition to this we have to pay 5 per cent. on the capital employed in working the place, &c., which will make our annual liabilities under "rent and interest" to amount to about rupees 820, or above rupees 7 per acre.

Buildings.

The buildings are situated in a central part of the farm, and in close proximity to the main road. The site is rather above the level of the surrounding land, and is well drained by natural drainage.

Overseer's Residence.

This is a small three-roomed cottage: the rooms are small, but the house is furnished with back and front verandahs. It is a brick building with a tiled roof. The foundations are laid with chunam. The walls, from about one foot above the ground, consist of brick laid in mud; they are pointed on the outside, and plastered inside with chunam. The verandahs are supported on brick and chunam pillars, and the floors are paved with tiles.

Cattle Sheds.

These are similar to those on the Experimental Farm. The roofs are supported on brick and chunam pillars, and consist of thatch over palmyrah rafters. The interal divisions and the outside fencing consist of palmyrah rails and posts. All the wood-work was thoroughly painted with coal tar. The sheds are divided into thirty-one loose boxes, each containing eighty superficial feet. The floors of the boxes are sunk two feet below the level of the surrounding ground. The straw-house, cart-shed, and pig-styes are similarly built. The grain-store and the poultry houses are built with materials similar to those used in building the Overseer's cottage. The total cost of these buildings was rupees 1,757-7-8.

Clearing and Levelling.

The timber was all sold by auction. The purchasers felled, and removed it at their own cost. The surface of the land was very irregular. Attempts had evidently been made at different times to bring portions under cultivation; many of these attempts had been made in injudicious places; the result was a broken surface on which it was scarcely possible to find a block of five acres fit for immediate cultivation. To bring this surface into a form fit for arable culture it was necessary to level many hollows and remove many hills, and, although a "*Commercial Farm*," we had no alternative but to perform a good deal of work of an unremunerative character, simply to give a more civilized aspect to the place. Its appearance is still far from satisfactory; but the further improvement must be the work of time and the result of a better system of cultivation. A farm created from the jungle, and which has only been in existence about four months, can scarcely afford any very pleasing landscape effects. The total cost incurred for levelling was Rupees 1,204-15-5.

Roads.

It was necessary to make several roads in order that all parts of the farm might be easily approached. The total length of these roads is 1,650 yards. They vary in width from six to nine yards. They are the ordinary ungravelled farm roads, protected on either side by an open drain. For the convenience of the public it may afterwards become necessary to gravel these roads; but this can scarcely be the duty of a "Commercial Farm." The total cost of these roads was rupees 408-1-10.

Fences.

Eight hundred yards of fence was erected on the side of the Mount road. This consists of an open ditch and a raised bank. A corkapilly fence has been planted on the inner side, and the outside is protected by an aloe fence. About 1,200 yards of internal fences have been planted; they consist of corkapilly. The total cost of fencing was rupees 142-11-3.

Live Stock

Nine pairs of draught cattle are now employed on the farm. This number will probably be too great for its future requirements, that is, after it has been brought regularly under cultivation; but for the next year or two, while we are carting manure, &c., the number will not be too great. A number of cattle were fattened and sold; the general results were satisfactory. A larger number would have been fattened had there been any certainty that we would have sufficient fodder. Sheep and pigs will be added to the live stock of the farm as soon as arrangements can be completed for their accommodation.

Crops.

Owing to the very late season at which we commenced with the farm, we were not able to get all the land ready in time for seasonable sowing. On the piece of land completed first we obtained *two crops of paddy*, and we might have done the same with *all the rest land* had it all been ready for cropping. We may fairly estimate that this second crop would have been worth from 150 to 200 rupees to us. Having no manure, and the land being in a very impoverished state, we had to content ourselves with a low class of crops.

Manure.

We had no foldyard manure, excepting what our loose boxes provided. Ashes from the neighbouring village, tank mud, brick-yard refuse, and a quantity of yercum leaves were all the other manures obtainable

Our loose boxes promise to yield a good supply of valuable manure; the only course open to us is to grow a large area of green crop for cattle and sheep food, and to make the place supply its own manure as soon as possible. It is useless to trust to purchases. The only foldyard manure available is wretched stuff, and not worth carting, besides being frequently full of weed seeds. I propose next season, as the experiments on the Experimental Farm were so satisfactory, to use a considerable quantity of saltpetre, lime, and bone-dust.

Implements and Machines.

Our stock of implements and machines is far from being complete. I propose making up, in the implement workshops for this farm, two or three ploughs, two or three carts, a drill cultivator, a seed drill, a winnowing machine, &c., probably the cost of additional machines will add a couple of hundred rupees to the amount of the tenant's capital.

Overseer.

Mr. Gregory Williams was appointed to take charge of this farm on the 1st of July 1870, and to his energy and practical knowledge must be attributed a very considerable proportion of the success that has so far attended this enterprise. I am glad to have this opportunity of expressing the satisfaction I have experienced in his general conduct, and with the readiness with which he has always carried out my wishes.

Labourers.

Nearly the whole of the labour performed in this farm has been done by Waddars, the ordinary tank-digger caste. Some of these men are now excellent ploughmen, and can perform many agricultural operations in a very creditable manner. This is the more remarkable as the members of this caste generally object to perform any work that cannot be done with the mamooties, and they possessed no knowledge whatever of agricultural work when we commenced the farm six months ago. They are good workmen, and will make useful farm labourers. They live in a village on the farm, so are close to the scene of their daily labours.

Model Farm Receipts.

	Rs.	a.	p.
From Experimental Farm—Tenant's Capital	2,776	9	10
Cattle	403	1	9
Guava fruit	364	0	0
Paddy	329	1	7
Sundries	104	10	3
Hay and Grass	42	8	0
Tamarind and Woodapple	23	0	0
Maize	24	6	3
Brinjals	29	4	2
Mango fruit	20	0	0
Poultry, &c.	12	6	0
Seed Gram	12	0	0
Plantains	9	10	0
Vegetables	6	12	8
Cholam	6	8	0
Tenney	5	10	0
Total...	4,218	1	2

Model Farm Payments.

	Rs.	a.	p.
Cattle	1,614	8	0
Labour	1,219	0	2
Implements, &c.	461	9	0
Cattle food	287	11	0
Seeds	149	9	7
Mango, Cocoanut, and other Fruit trees	76	10	0
Sundries	74	4	9
Poultry	27	12	0
Sugar-cane plants	7	14	0
Manure	3	0	0
Half-year's rent	192	8	0
Rent charge on capital expended on Landlord's improvements charged at 7½ per cent. as advanced	94	6	7
Interest on Tenant's capital charged at 8 per cent. as advanced	69	8	4
Total..	4,218	1	2

The Planters' Gazette.

BOMBAY, 21st NOVEMBER 1871.

THE ESTATES.

LUSHAI EXPEDITION.

A few days more, and the Lushai Expedition will commence. Vigorous preparations are meanwhile progressing on all sides. Commissariat arrangements are reported to be as complete and well-planned as practicable. Arms and ammunition are being served out to the Troops and the Police, and the latter is being thoroughly exercised in the use of the new rifles. Elephants are being shipped to Chittagong from Calcutta, and steps taken to send a similar batch to Cachar from Dacca. Mynadhur, which is separated from Monierkhal by the Bhoban range of hills, by about four hours' journey from that place, is now occupied by a detachment of the 44th N. I., and will, it is supposed, form the base of operations in Cachar. Captain Birch is to have the command of the Sylhet Contingent, a portion of which has already been told off to several parts in the frontier. Another Contingent, composed of a fine set of hill men levied in Sylhet, will shortly start for Chittagong via Comillah. The *Pioneer*, *Colgong*, and another vessel, have taken up ammunition and Commissariat stores to Cachar. Colonel Bourchier is there superintending personally the necessary arrangements in his department. General Bourchier is carrying on his preparations in his usual right gallant fashion, and everything promises a speedy and most successful expedition, terminating, it is hoped, in securing a safe and peaceful frontier for the future.—*Bengal Times.*

We congratulate our planting friends, says the *South of India Observer* on the recent order of Government, regarding rent for lands on the Neilgherries. Grass land is to be rated at eight annas the acre, from the time of its being taken up, and sholah land to be free for five years, then to pay two rupees per acre. This is a liberal policy, and we are sure that Government, as landlords, will not be losers in the long run. It is of the utmost importance that European capital and enterprise should be attracted to these hills. There is no doubt that the planters on these hills have suffered severely. First, under the Waste Land Rules they took up land, and had to wait three and four years for a title; in some cases were unable to sell even a share of their estate, as no title was forthcoming. A succession of bad seasons, coupled with a scarcity of labour, was the next hardship they had to endure. Then tea seeds were procured at a great expense, and with difficulty; cinchona plants were also expensive. We know one estate, of one hundred acres, where the cost of plants and seeds amounted to more than 9,000 rupees, or 90 rupees an acre; no doubt, the above large expenditure will be recouped in time, but the fact remains that the expenditure has been incurred, and the planter must wait years for his return. Tea does not pay under five years, and cinchona seven, at least.

We are rather in favour of the free rate or cowle for the first five years, than that the rent should advance gradually year by year, until the maximum is reached. In this manner the burden of the rent is apportioned to the crop. But we highly approve of the present rates adopted by Government. More than a year ago we strongly advocated that the rent of grass land should be reduced to eight annas the acre, remarking that the first expenditure on grass land to bring it into heart was equal to at least 50 rupees the acre, but then to make up for this digging and manuring, the land is more easily worked than sholah soil; ploughs can be used, whereas in sholah soil the use of ploughs would be impossible.

Whilst the Government are anxious to relieve the planters, we wish at the same time that they could have assured them that cinchona cultivation would not be extended to the detriment of individuals who have embarked largely in this speculation. Unfortunately, we know that the Supreme Government are insanely anxious to give cheap quinine to their royts, at the expense of private planters. As we have said before, they have no more right to do this than to give their soldiers cheap tea of their own cultivation. If Government ever begins this kind of competition, where is it to end? If they are so anxious to be benevolent to their royts, let them contract with Messrs. Howard, for a large supply of quinine, and then let them distribute it largely amongst the royts, at a low rate, say two rupees an ounce; it will even then be cheaper to the royts than amorphous quinine, at one rupee the ounce. We can understand that under the above conditions Government would confer an immense boon upon a suffering people, and at the same time would not enter into competition with planters, whom they had encouraged to enter upon a speculation, which they now are doing their best to annihilate. Every industry of this kind should be carefully fostered by Government, and as far as our own Government are concerned, we believe they are fully alive to the fact. It is the mischievous policy of Bengal that we dread, and would avert if possible.

We hear that the assessment for Government land in Wynaad is to be levied in the fourth year, three years being free; this is only fair, and we only hope that this relief, coupled with a succession of good seasons, will bring the planters successfully through all their trials. The tea planters are fortunate; the consumption of Indian tea has risen from two millions five years ago, to nearly ten millions at present, and promises to increase, whilst at the same time prices are remunerative. Indeed, whilst we fear that through the action of the Bengal

Government, cinchona is a doomed speculation, and consequently these hills are largely damaged thereby,—indeed we look upon the man who plants another cinchona tree before the policy of Bengal is declared, as an enthusiast to be pitied,—we at the same time consider that tea will do much for these hills; it is a safe speculation, and may be calculated to return at least twelve per cent. upon the outlay, if only ordinary care is used, and very probably far greater returns will be obtained. But it must be borne in mind that there is not an estate on these hills, at present, of one hundred acres, that is seven years old, hence we are quite unable to say what a full yield should be over such an area. Tea in Darjeeling, we observe, according to the tables of the *Economist*, yields four hundred pounds an acre; and this is by no means an unusual out-turn. We need hardly say that here, one half of this will give twelve per cent. and more upon the money laid out upon an estate, if only ordinary care has been used. Five years is no doubt a long time to wait for a return; hence the wisdom of Government in reducing the present rate of assessment.

CINCHONA.

CINCHONA PLANTATIONS.—NEILGHERRIES.

IN recent Proceedings of Government, a letter from Mr. Broughton, Government Quinologist, to the Secretary to Government, is published. The letter is a very interesting one, but too long for our columns. We gather from it the following information. Analyses of the bark of *C. succirubra* shows that up to May 1871, the total amount of alkaloids in the red bark had continued to increase, but the annual increments diminish in amount, a circumstance which indicates that the bark is arriving at its maximum of yield. The amount of quinine had diminished during past years in the red barks, although that of the total alkaloids had increased. During the last two years it appears that the amount of quinine has remained nearly constant, and probably in years to come, its amount will remain nearly stationary in our red bark. It also seems probable that the amount of obtainable crystallized sulphate of cinchonidine, is diminishing with the increase of age, although Mr. Broughton states, that with the present evidence, he cannot hold this to be quite clear.

The large amount of variation, according to circumstance of growth, met within the bark of *C. officinalis* renders a precise determination of its *mean* quality a work of great difficulty. Analyses though comparatively useless to determine the alteration of the bark with age, are however, adduced to show the high quality of the barks,—"a low yield is getting much less frequent in their bark than formerly. Both the crown barks of Dodabet plantation, which consists entirely of this species, and those of Neddivuttum are improving in quality." These two kinds divide between them nearly the whole of our plantations. For European quinine manufacture, the bark of *C. officinalis* is admirably suited, as it is so rich in quinine. In addition, it is easy to work, and the sulphate of quinine crystallizes with great readiness and purity. It is especially the bark for export to Europe. A small quantity is now packed for sending to England, and Mr. Broughton trusts that from time to time its export may be continued. In Europe the price of the natural red bark will hereafter sink, when it is brought into competition with crown bark. How far, by careful special cultivation of the red bark, it may hereafter be possible to modify this result, it would at present be premature to speculate.

After the above kinds, the most important at present cultivated on the plantations is undoubtedly that of *C. calisaya*. The bark of a variety with broad leaves, which are red in the under-surface and of vigorous habit, is the kind which should be propagated; as it is the one whose cultivation can be most profitably extended. The bark of our *C. calisaya* is of excellent quality, and is better suited for quinine manufacturer's use than than that of *C. succirubra*. Mr. Broughton regrets that a larger number of the trees has not been planted; but as the yield of bark from the present plantations will shortly be so large, he does not recommend any considerable extension, even with this sort.

In a previous report it was remarked that in the barks of *C. succirubra* and *officinalis* a high mean temperature appeared unfavourable to the production of quinine, that alkaloid occurring more readily in the bark of trees grown at high elevations within certain limits. Mr. Broughton has met with a remarkable illustration of this principle also in the bark of *C. Peruviana*. The bark of this tree grown at Neddivuttum generally contains no quinine whatever, and at best contains it in so small an amount that it is with difficulty it can be clearly detected. But by growing the same species at the higher elevation of Dodabet plantation, its bark quite alters its character, and yields in analysis an amount of pure quinine, which readily crystallizes as sulphate. Indeed, the bark thus grown, far more resembles the bark of *C. succirubra* than a grey bark. Mr. Broughton considers this instance of a total change of alkaloid, by increase of elevation, a most interesting one.

The remainder of this letter is so interesting that we are compelled to give it in full.

The occurrence of several remarkable varieties among the trees raised from seed has directed my attention to the occurrence of hybrids among our species of cinchona. In one instance I was able, from the account given by Mr. C. Dawson, then Assistant Superintendent at Neddivuttum, to directly trace the origin of a very beautiful plant, which was found to be a hybrid between *C. succirubra* and *micrantha*. This plant was picked up a seedling under a tree of the latter. I analysed its bark and found its yield was poor, but represented a mean between the qualities of the two species. Examination among seedling trees led to the discovery of many other examples of hybridism, especially the cross-breeds between *C. succirubra* and *officinalis*. In 1870 I communicated a short memoir on the subject to the Linnean Society. The occurrence of the demorphic varieties, "*macho*" and "*hembra*" in each species of cinchona was shown in this communication to render cross-breeding highly probable; in the same manner, as has been shown by Darwin to occur in *primula, oxalis*, and other plants. I learn from the discussion which took place on the subject at the Society's meeting, that the fact of the tendency of cinchona to hybridism was considered proved. Since that time I have made numerous analyses of the bark of various hybrids that I have observed, but in no one instance have I found any of special excellence. In fact, it appears to me that these hybrids combine the bad qualities of both their parents. I cannot but think that this ready hybridism between the species of cinchona affords an explanation of the occurrence of the numerous *varieties*, which have been recognized by botanists. I observe for instance, that a most recent classification gives 33 undoubted species, and nearly 80 separate varieties of cinchona. On our plantations there are several plants which, though certainly hybrids, would undoubtedly be made into species by a botanist ignorant of their origin. It seems therefore not improbable that several species, to which a separate name has been attributed, may be only South American hybrids. It is to be hoped that in any future botanical classification of the genus, this circumstance may be borne in mind. This fact of the interbreeding of the species renders the seed of a tree, surrounded with many others of a different kind, subject to considerable uncertainty of producing all plants like its parent. As a fact, the seeds of the variety I called provisionally "*lanceolata*" gave but few plants which resembled their parent, and consequently the *seedlings* had to be discarded. As the tree producing the seeds was surrounded on all sides by the ordinary crown barks, the variation in the seedlings becomes intelligible. In several preceding reports I have abundantly stated my convictions, and their grounds, for considering that living cinchona bark has its yield of alkaloids injured by exposure to sunlight. The experimental evidence of this already adduced, appears to me to be quite conclusive of the fact, so that further proof is scarcely needed. Further proof appears, however, in the circumstance of which I have been for some time aware, that the bark of opposite sides of the same tree differs in yield of alkaloids. This of course, is only fully apparent in trees that are equally exposed to sunlight on each side, which from the site of the plantations, does not generally occur. But the following analyses express the yields of the bark taken respectively from the north and south sides of a tree which is equally exposed on all sides. The bark was taken July 25th 1871.

	North side.	South side.
Total alkaloids	3·13	3·81
Quinine	0·83	1·48
Cinchonidine and cinchonine.	2·30	2·33

As the sun has been on the north side of the tree for the last four months, the effect has been that the yield of alkaloids has been diminished 0·68 per cent. This decrease apparently consists of quinine, which is commercially the most valuable of the alkaloids. This effect has been produced in spite of its being the most cloudy period of the year.—*South of India Observer.*

CINCHONA IN JAVA.

ACCORDING to the last published official report on the cinchona culture in Java (for the 2nd quarter of 1871), the number of cinchona plants of all ages, sorts, and sizes, have increased during that period from 1,730,795 to 1,741,522. In April and May, all the developed cinchona plants of the valuable sorts planted out in open ground were pruned, to the manifest advantage of the trees; this pruning yielded 2,[illegible] kilo-

quantities of bark, which were forwarded to Batavia, in 30 boxes. The valuable kinds of cinchona trees have not yet been regularly turned to account, hence it is no wonder that the Java barks exported so far can stand no comparison with the American barks of commerce. A disease has for some time been affecting some of the trees; but it has been greatly on the wane during the quarter, owing to the favourable weather and the repeated besprinkling of the diseased plants with a decoction of tobacco and a solution of the poly-sulphuret of calcium. In May and June, an official commission visited the eight cinchona plantations with the object chiefly of helping to trace out the nature of the disease: a long and close investigation convinced them that it must be looked upon as arising from parasitic vegetation, whose origin cannot be pointed out with certainty, because it shows itself very irregularly under varying circumstances.

Letter from the Acting Collector of South Canara, to the Acting Secretary to the Board of Revenue, dated Mangalore, 13th June 1871, No. 806.

With reference to the Board's Proceedings dated the 7th March last, No. 728, (Miscellaneous), I have the honour to submit the report therein called for on the experimental cultivation of cinchona in this district. In the month of December 1869, my predecessor, Mr. Thomas, in accordance with the arrangement sanctioned in paragraph 2 of the Proceedings of Government, dated the 20th September 1869, No. 2610, obtained from the Superintendent of the Government Plantations at Ootacamund, 53 plants of the cinchona succirubra. The plants suffered a good deal in transit. They were sent to Nagodi as soon as received, and were planted on the 27th December 1869 on a plot of land about 1¼ acres in extent, which had been previously selected and enclosed for the purpose. A gardener was entertained on a salary of Rs. 7 per month, and the Patail of the village was entrusted with the general care of the plantation. Owing to the damage sustained by the plants in transit, several of them never showed any signs of vigorous life, but thirty-eight survived transplantation, and, with the exception of two, which have since died, are now in a thriving condition. The height and girth of the thirty-six plants which are now growing are as follows:—

Height.	No. of plants.
6 feet high	1
5 do.	20
4 do.	15
Total..	36

Girth.	No. of plants.
4¼ inches in girth	1
4 do.	2
3¾ do.	3
3½ do.	10
3¼ do.	2
3 do.	11
2¾ do.	5
2½ do.	2
Total .	36

The Head Assistant Collector, who occasionally visits the plantation, informs me that while the plants are in as good condition as can be desired, the leaves suffer a great deal from a large green caterpillar. The gardener goes round daily and removes the insects, but in a large plantation it would be impossible to keep the caterpillars down in this way, and I intend therefore to send a specimen to the Superintendent of the Neilgherry plantations and to ask his advice as to the best method of preserving the trees from their attacks. Besides the plants received from Ootacamund four were obtained from Mercara, and put down on the same place in July 1870. Of these, three have survived transplantation, and are doing well, two of them being 3 feet high and one 2 feet. The girth of one is 1¼ inches, and that of the other two about 2 inches. Some tea plants were also put down, and are prospering well. The height of Nagodi (about 2,500 feet) is, however, not sufficient for their successful cultivation. The experiment has up to the end of the last official year cost Rs. 227 3-5 in wages of the gardener and other sundry charges, the whole expenditure being defrayed from the Jungle Conservancy Fund.

Submitted to Government with reference to paragraph 3 of Government Order, 14th May 1870, No. 706, Revenue Department. As an experiment the plantation at Nagodi seems to have done well, but the Board remark that Major Beddome, in his letter recorded in the Government Order above quoted, advised that plantations should not be formed in South Canara, except as a mere experiment with a few plants.

Order thereon, 27th July 1871, No. 1,314. The experiment does not seem likely to be productive of very useful results. The Collector will consider whether it is worth-while to continue the employment of the gardener. The cinchonas could be entrusted to the Patail with the promise of an annual gratuity if they were well-cared for. They are now nearly large enough to take care of themselves. Private individuals might also receive seed and plants in time.

TEA.

The tea-planter will read with interest the second paper, in Part I. of Vol. III. of the Journal of the Agricultural Society which is contributed by Dr. George King, late Deputy Conservator of Forests, Kumaon, entitled *Remarks on the Pruning of Tea.* These remarks will probably be found useful by those engaged in tea-culture on this side of India, though the writer's experience has been gained by inspection of the gardens of the N. W. Provinces. This paper appears very opportunely now, when, the manufacture having nearly ceased, the planter has to turn his attention to cultivation, and more especially to *pruning his plant.* Dr. King alludes to the fact of the neglect in former days of the commonest principles of horticulture as respects the culture of this important plant. A change has since taken place, and the result is apparent; but the more advanced cultivator will, nevertheless, derive several useful hints from the perusal of this paper, which indeed, we consider, should be in the hands of every tea-planter in India. We feel inclined to take up several subjects contained in this useful paper, but our limited space forbids. We must close our notice of it by extracting the following words of warning, which all owners of tea-gardens should lay to heart:—"Pruning, such as has been recommended, cannot be practised successfully on one set of bushes for ever. A time must arrive when they will cease to respond to the calls upon them, and to begin to yield but poor and small leaf, and little of it. Entire exhaustion will eventually follow, but we have yet to learn how long, under such a system, they will continue to yield *profitably.* With generous treatment they may probably do so, until they are 15 or 20 years of age, or even older; but the wise planter will provide for the future by laying down, year by year, new patches of bushes to succeed the old." The other papers in this number are short, but more or less interesting to the growers of tobacco, cotton, paddy, and other tropical cultures.—*Englishman.*

THE CHEMISTRY OF TEA.

(*From the Lancet.*)

The May number of Liebig's *Annalen* contains a paper, by Zoller, on tea, from which we abstract the following:—

It used to be believed that the different kinds of tea came from different species of the tea-plant; but the researches of Siebold, which have been confirmed by fortune, have demonstrated that one and the same plant, *thea sinensis,* modified by climate, soil, and cultivation, furnishes all the tea which is in the market. Differences in the manner of preparing the leaves, and differences in the age of the leaves, also affect the quality of the tea, giving rise to differences in the commercial article.

Touching the influence of climate, it is worthy of notice that the tea-plant will bear a wide range of climatic variation without suffering serious deterioration. The richness of the soil and the mode of cultivation, however, exercise a paramount influence on the quality of the tea. In this respect the tea-plant is like the tobacco-plant or the mulberry-tree.

Again, the method of preparation of the leaves is a comparatively trivial matter, whilst the age of the leaves is of prime importance. The youngest leaves give the best tea. Hence the explanation of the high price of choice varieties of tea. Choice teas consist of the youngest leaves and to produce any considerable weight of young leaves a great number of plants are required; whilst the same weight of old or full grown leaves is produced by a comparatively small number of plants. Zoller shows that the age of tea-leaves may be ascertained by a chemical examination of the ash left on incinerating them. As the leaves grow they lose in potash and phosphoric acid, both absolutely and relatively, and gain in lime and silica. Examinations made at periods, fourteen days asunder, exhibit these phenomena with sufficient distinctness. In the practical examination of teas there is, therefore, a very simple and valuable rule: much potash and phosphoric acid together with little lime and silica means good tea, and the reverse bad tea.

Having received a splendid specimen of tea grown in the Himalayas by a friend of Baron Liebig's, Zoller set to work and made a chemical investigation of it, and obtained the following results. In 100 parts of the tea there were 4·95 parts of moisture, and 5·63 parts of ash. The ash contained in 100 parts:—

Potash	39·22
Soda	0·65
Magnesia	6·47
Lime	4·24
Oxide of Iron	4·38
Protoxide of Manganese	1·09
Phosphoric acid	14·55
Sulphuric acid	trace
Chlorine	0·61
Silica	4·25
Carbonic acid	24·30
Total	100·00

These numbers show very plainly high potash and phosphoric acid, together with low lime and silica. Zoller also made an infusion of this excellent specimen of tea, and communicates some interesting particulars. 100 grammes of the leaves was infused for a quarter of an hour in 3 litres of boiling distilled water, and the liquid poured off. Then a second 3 litres of boiling water was poured on the leaves and allowed to stand for a quarter of an hour. The 6 litres of infusion were subsequently evaporated to dryness, and the residue dried at 100° cent. and weighed. This dry residue was found to amount to 36·26 per cent. of the original tea leaves; the remark being made, that in the above described operation, the tea leaves could not have been perfectly exhausted of soluble matter, and that the real proportion of soluble matter in the leaves must have been still higher than the experiment indicated.

The tea leaves in their ordinary or air-dried condition contained 5·38 per cent. of nitrogen. The percentage of *theine* in the leaves was found to be 4·94. Theobromine was also detected.

A comparison of the analysis of the original tea leaves with that of the tea leaves after they have been exhausted with boiling water is given. After extraction, the percentage of potash in the ash is 7·34, whereas, before extraction, the percentage of potash was 39·22; showing how the analysis of the ash may be employed as a criterion to recognise adulteration of tea with spent tea leaves. A point insisted upon in this interesting memoir is that the greater proportion of the nitrogenous material in tea is not present in the form of *theine*. Peligot has shown that this other nitrogenous material is a protein compound, being a substance like casein. Tea is therefore, to some extent, food, and Zoller points out that 100 parts of Himalayan tea contain, in addition to the 4·94 parts of *theine*, 13·7 parts of protein compounds.

TEA.

ENCOURAGING, as it must always be, to the promoters of European enterprise in this country, to see their efforts year by year meet with success in the manufacture of tea, it is some abatement to their ardour to learn by successive telegrams from home that there exists a hiatus in the confidence felt by dealers in the genuineness of the plant exported from Bengal. Not that our native product needs puffing or any other form of extrinsic stimulus to render it acceptable to the public of England. It has long since established a reputation for itself, of which, neither detraction nor the vulgar fallacy of its inferiority to China herb can rob it; still, it has been clearly demonstrated by results that the valuable and promiscuous cargoes that leave the shores of India for home consumption must go weighted with some better accompaniment than the popularity of a particular brand, to ensure them the favourable reception their claims deserve. Adulteration is commonly believed to be the chief disposing cause of this want of entire reliance on the predominant excellence of Indian tea over Chinese—a circumstance of some significance, when viewed in connection with the theory that the produce of our gardens undergoes dishonest manipulation previously to shipment for the London market. We need hardly point out the unfounded nature of such a suspicion. Bengal planters, managers, and joint-proprietors of plantations, and in fact all connected more or less with tea speculation, may be taken as a rule, to represent capital, intelligence, and last though not least, so much of honesty of principle as to be above the petty imputation of tampering with a commodity towards the improved manufacture of which their best energies and talents are directed. It is unprofitable as well as absurd to speculate on the probability of men sacrificing their interests to the mere love of sharping; for, admitting the fact that the purest manufacture is deemed the most valuable, we are forced to allow that the study of their personal benefit alone would keep manufacturers honest, were no higher incentive present. If then we ask ourselves where Indian, and especially Bengal tea is sought to be deteriorated by admixture, the reply suggests itself with unerring certainty—in London—and here we may follow the thread of our last article on this subject. Not unnaturally to the uninitiated the idea might occur that inasmuch as every chest of tea is lined with metal foil, no adulteration can be attempted without being followed by discovery and exposure. From the evidence of Dr. Normandy, however, it would appear that there is no such security. "A large tea-dealer," he testifies, "met me one day in Benchurch-street, saying, "Doctor, I want you to come with me and see what beautiful seams the lead of tea-chests is closed with." He then tells us that the tea-chest as it comes from the warehouse is closed, and there is only a hole about the size of the hand, cut into the metallic sheet inside the chest, for the purpose of taking out a sample. Metallic sheets are cleverly and beautifully soldered together, the tea packed between them being protected by this means from damage by contact with any foreign substance; but it must not be supposed that the seemingly unbroken appearance of the sheet of metal is a criterion of the contents being unadulterated. Through the aperture which is made in the metal for the purpose of taking samples, the whole contents are emptied on a clean floor, and the tea is then mixed with whatever composition it may be thought fit to add, and worked up with tea of an inferior quality, and which, by themselves, would be unsaleable. To use his own words:—

"I saw there a room, which was perfectly clean, boarded with very clean boards, and there were heaps of tea piled up against the wall; there was a rope against the wall, which served the following purpose:—The mixture of teas, and of magnesia, being made on the floor, as just stated, then the question comes, how the same quantity can be re-introduced into the original chest from which it was taken. It is done in this way:—A small quantity of tea is put into the chest, a man puts his foot within the chest, through the hole, grasps the rope against the wall to steady himself, and by a series of jerks, he succeeds in packing it up tight: and so he goes on with another layer, and process is repeated until the chest is eventually filled up as tight as if it had not been touched. This I know from personal observation."

As the rule is very general to drink milk and sugar with tea, the difficulty of detecting adulteration in tea is not small, except in cases where unpalatable substances are largely introduced, and in Germany the difficulty is increased by the addition of rum and vanilla, as the delicate flavour of the tea is altogether lost by their means, though it may be owned that no ordinary process of ingenuity could render the tea drank in Germany very much worse than it usually is.

Thus far we have the amplest testimony that adulteration is common in London, but we doubt, nay, we may be certain whether adulteration is possible before invoices are shipped for home, and the increase of manufacture would seem to suggest that even the simplest form of sophistication is deemed unworthy of attention in the centres of cultivation in Bengal. In 1865, the import of Indian tea to the London market amounted to 5,000,000; four years later it had swelled to 15,000,000 of pounds, or say in round numbers that during five years' importation in tea has steadily increased to three hundred per cent. With such results adulteration holds out no prospects of adoption, save by petty retailers, who may possibly under extraordinary pecuniary pressure, "suit" their invoices. But while we set our face against mixing a pure product with a foreign substance in this manufacture, we are not at all certain that a tea which fluctuates between the delicate and scented tea of China and the penetrating, pungent leaf of Bengal, would not find favour at home. While taste runs in minorities as it does in India, and large majorities are often swamped by the veto of half-a-dozen known epicures, it is hard to exercise the public of the canons which it has accepted as infallible. Taste will have its way, and tea must keep pace with its changeful mood. Our planting friends will do wisely to look well at this side of the question. Excellent, or the reverse, fashion has but to dictate to be obeyed; and in tea as in everything else, the aristocracy of intellect and discernment must prevail.

Adulteration is, however, not restricted in its systems either to London or China. Various devices are resorted to, which show some semblance of affinity and may therefore easily be mistaken for each other. We find thus that there is a prevalent plan in China which so nearly resembles the theory of adulteration in India as to be often mistaken for the latter. We have shown that there is no adulteration, properly so-called in Bengal, and we cannot too often repeat the statement but as a theory—intemperately whispered perchance by one who had never seen a tea-plant—has somehow to a small extent been afloat in the public mind of England; it may be as well for our planting friends to refute as fully as possible the mischievous idea by a full exposure of the system prevailing elsewhere. With this view we quote from a communication made by Mr. Medhurst, British Consul at Shanghai:—

"The banks of the numerous creeks are planted with willow-trees the young leaves of which are collected in April and May, very much in the way that tea-leaf is gathered. The produce is then collected in heaps on the hard threshing floors of the hamlets, and is allowed to undergo a mild fermentation in the sun. The leaves are then manipulated similarly to those of the ordinary tea-plant. They are sorted into kinds according to sizes, and are afterwards roasted in common tea-ovens. The appearance of the stuff after this treatment is not unlike that of genuine articles, and is carried to Shanghai, and there intermixed with pure tea at the rates of from ten to twenty per cent."

The very promising picture held out to us in this statement is the reverse of comforting to the Bengal Planter. "Pure tea" made up of willow-leaves, may be to the palate attuned to such beverages, particularly grateful; to us, we confess it is not, especially when we remember the extensive and not unfrequently pernicious systems adopted by Chinese [illegible] to bring our Indian teas into a contempt, from which they feel they can no longer rescue Chinese varieties.—*Bengal Times.*

COFFEE.

COFFEE LEAF DISEASE.

SIR,—Why are planters so quiet about this leaf disease? Can it be possible that they look upon it as a matter of no consequence, or are they afraid to face the disheartening difficulty? That the disease is rapidly spreading—and that its ravages are most disastrous, no one who has ever seen a coffee tree can doubt. My experience of the blight extends only to the past few months—but I don't hesitate to say that trees *die* from the disease, or it may be from what *causes the disease*. I have seen a field of fine luxuriant coffee, reduced to sticks in less than two months. I am no alarmist—what I have stated is miserable fact.

October 1871. Yours faithfully,
NEAR KANDY.

THE FLOWERING OF THE "YUCCA GLORIOSA."

(*To the Editor of the Ceylon Observer.*)

DEAR SIR,—Can any of your shrewd correspondents inform me what is the proper time for the flowering of the *Yucca Gloriosa?* In a compound in Colpetty there were some very fine heads early in the year, and now there are some eight or nine just bursting into flower—one of these plants having already borne a fine head in March last. These same plants were in flower when the Duke was here last year, but there were no blossoms in September. I am curious to know if the change in our seasons can have anything to do with this second flowering, having always believed that the *Yucca* is not over-fond of displaying its beauties—not even regularly once a year.—I am, yours, &c., YUCCA.

September 25th, 1871.

BUG ON COFFEE BERRIES.

SIR,—In your issue of the 23rd instant, you have it that I *suggested* coffee berries were sometimes sucked by a kind of bug. This is, however, no mere *suggestion* of mine, but a *well-ascertained fact*, in support of which please see (and copy if you like) my pamphlet on the "*Enemies of the Coffee Tree*," published ten years ago, where (page 18, No. 6) you will find the insect in question duly noticed.—Yours faithfully,
J. NIETNER.

Fernlands, Poondaloya, 27th Sept. 1871.

P. S.—Weather dry, coolies plentiful, estates in excellent order, crop hanging back, no regular picking till November.

[EXTRACT REFERRED TO:—"6 *Strachia Geometrica*.—This is a bug, but of a different description from the brown and white bug, to which it bears but little resemblance. It is oblong-oval, angulated, plump, 5-16ths long by 3-16ths wide, of yellowish colour, marbled on the upper side with grey and orange. It is allied to the so-called green or forted bug. Mr Alexander Brown received this insect from Badulla and kindly forwarded it to me. It feeds upon the juice of the young berries, three per cent. or more of which were said to have been damaged from this cause. This is the only instance of coffee suffering from this insect that has come under my notice. However, allied forms are found both here and in Europe, doing sometimes considerable damage to vegetables by destroying the buds. There is no fear of the insect ever becoming a *serious* nuisance on coffee plantations."]

ENEMIES OF THE COFFEE PLANT.

WE have recently had an opportunity of examining leaves and berries of the coffee plant, bearing unmistakeable signs of having been attacked by some insect whose ravages are fatal to the health of the tree, and destructive of a portion of the crop. The leaves are more or less covered with patchy discolourations, having all the appearance of being burnt by some strong acid, whilst the berries are punctured through on one side, and the internal stricture entirely destroyed. The following letters from the Director of the Botanical Gardens explain his views of the phenomena:—

Botanical Garden, Peradenia, 21st Aug. 1871.

"I have just been examining with some care the diseased coffee leaves and berries you have sent me.

"The red spots upon the leaves are undoubtedly examples of the fungus, about which a good deal was written in the *Observer* some months ago.

"The spots upon your coffee berries may possibly be produced by this fungus, or may be the result of an insect's puncturing.

"You should look carefully at the berries whilst they are upon the tree, and see if you can detect upon any of them the red powdery appearance of the leaf spots, taking care not to handle the berries, as any of the red powder (sporules of the fungus) which might be upon them would easily be rubbed off, and so escape detection. I cannot discover any upon the berries you have sent me, though some might have been present before the berries were gathered, and had been rubbed together in the bag.

"You should notice, too, if your coffee trees are infested with a kind of bug, green or brown in colour or perhaps reddish, of offensive odour when handled. There is a species of bug which seriously injures the paddy crop occasionally—by sucking the juices of the young grain, so it is not impossible that coffee may have a similar enemy, as suggested by my friend Mr. Nietner.

"In cavities of the diseased coffee berries, I sometimes see cobweb-like fungus mycelium, but this may be a secondary growth, and not the cause of the malady.

"Pray let me know the result of your further observations upon the spot. I will give the matter further attention, and examine more fully the structures in a disease state, under my powerful microscope, and you shall know if I am able to arrive at any definite conclusion."

25th August 1871.—"A further examination of your coffee berries pretty well satisfies me that the injury is due to the attacks of an insect. The mischief is certainly from the outside, as the bean is very frequently not at all affected, though there may be a large discoloured spot upon the cherry.

"The leaves are most decidedly attacked by the coffee leaf fungus which I first heard of from Madoolsima, but which is now spread throughout the coffee districts of the island, though doing most mischief, apparently, amongst the native coffee and in the warmer districts.

"I have just heard of native trees at Tumpane dying from the attacks of this fungus."

"Pray tell me if you detect the red dust like sporules upon the berries of your coffee. I cannot find that the berries are affected here, even upon trees much infested with the fungus."—*Ceylon Times.*

CEYLON PROSPECTS.

(*From our Special Planting Correspondent.*)

The weather is fine almost beyond precedent for the month of October. Dry it is, till the ground cracks, the leaves get brown, and even jungle withers. This was the case a month ago in the lower part of Matale and Kornegalle, where I was told they had no rain for three months. I seen correspondent in your issue of the 7th corrects my information saying they had 12 inches in that time. However, as I know the correspondent in question, I may tell you at once that it was not his part of the district, though low, that I referred to. It was lower still—that portion of Matale that stretches from beyond the Yattewatte pass to Matale. I passed over that road about the time I wrote, and certainly it looked all I said. The ground was baked and cracked. Coffee trees were dying out from excessive heat. The very paddy-fields looked sickly and miserable from want of water. The low-land and the road side shrubs dropped and shed their leaves. The grass was the colour of straw, and I regret to say that this may now be said of some portions of Matale proper, and of a great deal of Doombera.

Crops hang back in consequence, and considerably less has been gathered than at this time last year. We are told that more coffee has gone down by rail than to this time last year, this apparent anomaly is, however, easily explained by the fact that the late run of fine weather has pushed forward much old crops from the late districts, as well as considerable parcels of early crop from all districts. In fact, instead of having lots of wet coffee as we generally had in October, it had been dried and despatched as fast as gathered both last month and this, that is, our early picking has been mostly despatched. We are now having a lull, and are waiting, and hoping, and are longing for the monsoon. The North-East cannot be far off, as its usual precursor, lightning, has been vivid and frequent during the last few evenings, and thunder has been heard; while heavy clouds are seen rolling up from Dambool towards Matale. With the first few showers crop will ripen up fast, as there is a great deal in the yellow and slightly reddening stage which will come on with a rush when the new monsoon touches it.

Short crops were from the first expected; but they will be shorter still than many yet believe. Even late estimates have had to be revised since gathering began, and in many instances with a very serious diminution. And, what between the leaf disease which is spreading rapidly over whole districts, and short crops everywhere, it is enough to depress the spirits of the boldest believer in big crops. Hope is, however, a capital feeling, and without it many a timid spirit would be crushed. There are not a few planters who yet feel sanguine of their original estimates, or nearly, and who believe in the coming monsoon revealing much more pallam on their trees than was previously apparent. I am no alarmist, and do *not* wish to discourage such expectations. All I say is! "Wait and see." Our only consolation under such adverse circumstances is the fact that prices continue to keep up. Long may this be the case.—*Ceylon Observer.*

THE LEAF DISEASE.

THERE is no use says the *Ceylon Observer* avoiding the fact any longer that the leaf disease, to which allusions for many months back have been made in our columns, is a far more serious danger to the coffee attacked by it, than has been suspected by the vast majority of the planting and general community. From the lower districts around Candy and Matelle most discouraging reports reach us of the evident spread of the disease and the (quite as evident) serious results from its ravages. Some of our most experienced planters have at last taken the alarm and express themselves in no equivocal terms on the material injury inflicted on coffee fields in Nilambe and around Deltotte as well as in Lower Matelle. Nor can the appearance of the disease be attributed to poor cultivation, for some of the best managed estates in the country are suffering from it. The disease would seem to appear after a protracted drought, against which the coffee trees in the lower and older districts are not able to keep up their strength, even when well-manured. The age of the trees can alone explain the persistence with which the disease clings to highly-cultivated properties, and turns so many flourishing green fields into an apparent collection of dry sticks. Our special planting correspondent alludes to the subject, but not so particularly as some other writers in our columns. It would seem now that for several years back, the native coffee gardens in the lower districts have suffered so greatly as to be in many cases nearly killed out by the destruction of the leaves and vegetation on the trees. Unseasonable and protracted dry weather is undoubtedly the primary cause of the disease, but it would appear that having once got a hold on an estate—especially with trees past their meridian—it is a most difficult matter to shake it off, and especially to bring back a full growth of vegetation on the denuded bushes. Mention has been made to us of fields judiciously and elaborately manured last season in a manner which never failed to produce a marked effect in previous years, but which on this occasion has failed to improve in any degree perceptible trees which had been affected by the disease. The cause and effects of this coffee leaf disease are, then we think, worthy of more careful examination than has yet been accorded to them. The opinion of Mr. Thwaites of the Peradenia Botanic Gardon, is doubtless correct that the disease only appears in very dry and exhausting seasons, and disappears with the return of a season of continuously wet and refreshing weather. He describes it as the coffee leaf fungus, and he first heard of it from the distant district of Madoolseema. The prospect of the disappearance of the pest in favourable seasons is satisfactory; but meantime, unless some means can be devised for keeping trees in heart, the danger is that old fields of coffee will become exhausted beyond recovery. The subject, therefore, is one for the immediate attention of the Planters' Association, and the question to be solved is how can highly cultivated but old coffee in low districts subject to drought, be kept free of the ravages of leaf disease, or best maintained in heart, until the return of wet weather drives the fungus away. On the result of such an enquiry hangs, we begin to fear, the ultimate fate of a considerable acreage lately considered amongst the more substantial portions of the coffee cultivation in Ceylon. It is a consolation under these circumstances to feel that, whatever other drawbacks may attach to high districts, they cannot possibly suffer from a disease brought on by protracted drought. Dimboola, Dickoya, and Maskeliya, on which the future of the Ceylon coffee enterprise so greatly depends, are never likely to be afflicted with leaf disease, and besides the large extent of forest land in private hands yet to be opened, there is enough crown land remaining in that direction to form two or three respectable districts, at least averaging the extent of the two or three lower ones overrun by the leaf disease. Six thousand acres of forest land will, we are assured, on most competent authority, be added this coming season to the cultivated area in these three districts, and the process of felling will go on until the districts are merged in one grand expanse of coffee, perhaps twenty miles long by an average of ten in breadth. We said in our last overland issue that he would be a bold man who would deny that the Government of Ceylon had all over the country at least a reserve of 100,000 acres of land suitable for coffee cultivation. This estimate has been disputed as too high, but when we remind our friends who would cut it down by one-half that over 35,000 acres have been disposed of since January 1869, they confess themselves staggered. Are we to be told that the Government cannot, during the next ten years, bring forward twice the extent of land added to the quantity in private proprietor's hands during the last three years? Eighteen thousand acres have been added to the *cultivated* area alone in three years; and on the authority of Mr. William Smith, of Dimboola, we may expect to find 30,000 acres more readily available for coffee in the forests, out of which Maskeliya blocks have been cut and stretching on through the wilderness of the peak. Notwithstanding these compensating circumstances, when the prospects of our lower coffee districts are under consideration, there can be no denial of the fact that at the present moment a large number of planters have up-hill work before them. We look back on a short crop resulting in a less export by 100,000 cwts. of coffee (worth on the spot perhaps £325,000) than during the last season, and we have to face the approach of another season in which the out-turn is not expected to be much better all over the country, although there are some satisfactory exceptions to the general cry of short crops. The good prices now prevailing, and the prospect of their maintenance, as well perhaps of even further improvement, serve greatly to relieve this discouragement, and fortunately there is in addition a superabundant supply of cheap labour together with cheap rice. We trust the hope of favourable weather during next blossoming season may not be disappointed, and that for 1872-73 a bumper crop may be the rule, and not the exception.

EXTRAORDINARY DELUSION AMONG COOLIES.

(To the Editor of the Ceylon Observer.)

SIR,—I am an old resident, and while I know how ignorant and credulous the natives, both Singhalese and Tamils are, I confess I have been lately much surprised at finding how prevalent in all this district is a general distrust or terror on the part of the Tamil men for their personal safety. The belief is that the deity of one of the temples, I cannot make out which, but a shrine at Kaludewell near Matale is spoken of with special significance, is calling for a human sacrifice, and that shortly such a sacrifice must be offered. Mr. Moir, of Sudugangа, is mentioned as a gentleman careful of the safety of his coolies, and my coolies tell me that he has placed a guard over his estate to protect his people.

I have no doubt but that it is his coffee now ripening that Mr. Moir is protecting, but so do not believe my coolies, who are in a state of real alarm, and say that this belief is a matter of common talk about Matale. The thing is melancholy in these days of progress and enlightenment, and if you do not think it too absurd, you might give this a place in your columns.

Matale, August 25. PLANTER.

P. S.—I find I have much understated the requirements of the deity calling for sacrifices—1,000 human heads are generally supposed to be required—coolies in a gang for protection from a neighbouring estate have this morning passed my house on their way to Matale for marketing, armed with knives and cudgels.

[We have to thank our correspondent for sending us a piece of information so strangely curious. Ought not the missionaries to the Tamil coolies investigate the matter and endeavour to dispel the poor creature's fear after the plan adopted by Mr. Murdoch many years ago with the Singhalese at Matura, when he challenged the native charmers, devil-priests, &c., to do their work on him by spell and incantation through the agency of their 'gods' and 'devils.' But we suppose the same excuse would be made, that the native people's gods have no power over the white man.—ED. *C. O.*]

MARKET REPORT.

LONDON, 2nd *October* 1871.

COFFEE.—Steady market, but less active. 500 bags bold Native Ceylon sold from 61s. to 61s. 6d. Latest sales about comprise about 280 tons good ordinary native, price not disclosed. A cargo of Bahia, 2,940 bags, per *Pleiades*, at 54s., for a near port; one of Rio, per *Johann Maria*, 3,600 bags, half capitanos and half fair Channel, at 57s.; also for a near port, one ditto, per *Adia*, 3,637 bags fair mixed Channel, at 56s. 6d., open charter, and one of Santos, per *Silver Stream*, 3,280 bags, at 60s. 6d. open charter. At auction, on Tuesday, 540 casks, 70 barrels and 250 bags plantation Ceylon chiefly found buyers at full prices. 150 bales and 300 half-bales Mocha partly sold from 91s. to 92s. 6d. 510 cases and 800 bags plantation East India were nearly all taken out, there being little demand. At the auctions yesterday, of 130 casks plantation Ceylon offered, about 50 casks sold at 70s. 6d. to 72s. 6d.; peaberry, 82s. to 84s., the remainder held for higher rates. 1,300 cases Coorg sold readily at firm rates—small to bold dull, 60s. 6d. to 75s. 6d.; colonry, 78s. 6d. to 80s.; peaberry, 83s. to 84s. 6d.; 130 cases Mysore part sold—small, 78s. 6d.; bold, 95s.; peaberry, 84s. 6d.; and 230 bags Rio, ordinary, 63s. 6d.; grayish, 64s. colonry, 72s.; privately 200 tons native Ceylon sold for arrival at 63s.

TEA.—There has been a fair steady demand, chiefly for the better kinds of Congou. Yesterday 3,600 packages China all sold without reserve: Congou fannings, 5d. to 7d.; old black leaf, 9½d. to 10½d.; ditto, red leaf, 9d. to 10½d.; medium new black leaf, 1s. 3½d. to 3½d.; new season's scented orange pekoe, 1s. 8d. to 1s. 9d. The deliveries in London estimated for the week ended October 9 were 1,327,623 lbs., which is a decrease of 11,908 lbs., compared with the previous statement.

INDIGO.—October Public Sales commenced in London on the 9th ultimo, and concluded 18th idem. The auctions passed with good spirit, showing an advance on the prices realised at the last quarterly Public Sales in July of 2d. per lb. on common kinds, and 10d. on good qualities, and no doubt still better results would have been obtained but for the advance in the Bank of England rate of discount; however, since the Public Sales concluded, prices have continued very firm, clearly indicating the strong position of the article. The estimated out-turn of the year's crop is now set down at 90,000 maunds, or about 12,000 maunds less than the estimate arrived at in August last. The local Public Sales will commence end of the current month, but they will be less interesting than usual, for already 35,000 maunds have been sold privately to arrive, leaving only 55,000 maunds to come under the hammer.

INDIAN TEA.—At a Public Sale held on the 30th ultimo 307 packages were offered, of which 133 were withdrawn, the remainder finding buyers at about previous rates. By private contract about 500 boxes of Dayrah Doon Souchong and Pekoe Souchong have sold at ten annas six pies, and 500 boxes of Pekoe at eleven annas six pies per pound all round price, also 300 chests of Kalabingo growth at fourteen annas per pound, average price. About four thousand packages are printed for Public Sale on Friday next, and further large sales are expected during the ensuing week. Advices received by telegram from London quote the market quiet, and prices easier.

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

VOL. III.] BOMBAY, THURSDAY, 21st DECEMBER 1871 No. 5.]

Agricultural Gazette of India.

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LETTERS TO THE EDITOR.

THE DISCOVERER OF TEA IN ASSAM.

To the Editor of the

Agricultural Gazette of India.

SIR,—In the issue of your *Gazette* of the 15th of July 1871, I find a letter from Mr. D. Bruce, of Assam, in which he states that "in the different treatises on the cultivation of Tea, lately submitted to the Agri-Horticultural Society, no mention is made of the name of the discoverers, while others again couple Lieutenant Charlton's name with the discovery." Now, Sir, I have not the pleasure of knowing Mr. Bruce, nor can I give any opinion upon the prudence he displays in quoting any statements contained in the "Tea Essays" submitted to the Agri-Horticultural Society. This I may say, however, that he must have been very diligent in his reading if he managed to wade through the whole of those Essays between the 1st of March and the 24th of May.

I have understood from the writer of at least one Essay, that he was perfectly aware that Mr. Bruce, the merchant, was the first to discover the Tea, and that he was duly recognized and rewarded by the Society of Arts, not by the Royal Society, which is quite another body.

I may mention that my informant further says that Moorcroft had brought the existence of Tea in India to the notice of the then Board of Directors in 1821, (so that Mr. Bruce was probably indebted to him), and I have pleasure in referring Mr. D. Bruce to "Moorcroft's Travels in the Himalayas," &c., (1821) in corroboration of this fact.

As Mr. D. Bruce says, however, Lieutenant Charlton brought the matter very prominently forward some years later, and his, and also Captain Jenkins' services were very properly recognized.

I trust, however, the controversy on these points will not be renewed, as it would certainly result in Moorcroft's being proved to be the first person on record to have pointed to the existence of indigenous Tea in Northern India.—I am, Sir, yours obediently,

2, *Whitehall Place, S. W.* VERITAS.

WATER. ITS VALUE, USE, AND ABUSE.

To the Editor of the

Agricultural Gazette of India.

SIR,—When a Government, like that of India, proclaims to the world, almost by sound of trumpet, that being Sovereign Landlord of British India, its duty and inclination towards its millions of tenants, induces it to foster and improve the neglected agriculture of the country, it tacitly admits that means and money are at its command for initiating, carrying on, and completing the important work it has undertaken.

With capital at command, improvements in agriculture resolve themselves into problems for practical solution.

Problem First.

Given canal water, of considerable purity; to find the best practical means for depriving it of its injurious powers as a solvent of valuable fertilizing mineral matter present in the soil, which is removed in solution to the subsoil, and is finally lost by percolation to the immense injury of the land and agriculturist.

In the Presidency of Bengal, starting from Cawnpore and halting at Peshawur, the vast interlying extent of country is more or less artificially irrigated. The Supreme Government of India has, at very considerable cost, constructed magnificent canals for enabling its *Ryots* to enjoy the full benefits of canal irrigation, and where this is not available, the agriculturists may sink "*Cutcha*" or "*Pucca*" wells at discretion, being when necessary helped with funds to enable them to do so. The money is advanced on the security of the crops, and in Revenue parlance, is called a "*Tuccavee*" loan or advance, which can be as well expressed in English as an "Agricultural Loan."

The water derived from such wells is, as a rule, sufficiently impure to be unfit for drinking purposes, until subjected to clarification. But this defect renders it admirably adapted for agricultural purposes.

The impurities contained in well water are alkaline and saline, and as such mineral matters are of vital value to growing crops of every description, the lands under well irrigation produce good crops from year to year, without becoming impoverished, because after each irrigation an addition of mineral matter is made to the soil, and as long as this is kept up, fertility is ensured, and will continue, until the source from whence the mineral matters are derived shows signs of exhaustion, which will be made apparent by the crops and produce becoming annually smaller in quantity and lower in quality. From a consideration of these facts, but one conclusion can be drawn, and that is, that the value of water, as a fertilizer, depends not on its purity, but on the percentage of suitable mineral matters held in suspension and solution.

With the exception of the Peshawur Canals, the water of the Ganges, Jumna, and Punjab River Canals, is remarkable for its purity. All these rivers have their sources at or near one vast fountain-head, situated in the Himalayas, being most probably fed by the waters of the "*Manu Sarowar*" lake which, for natural purity may vie, for all we know to the contrary, with the water of the "Loka" in the north of Sweden. This singularly pure water contains only 1 20 (one-twentieth) of a grain of solid mineral matter in the Imperial gallon of ten pounds, or 70,000 grains, and is therefore capable of performing all duties expected from distilled water.

If the waters of the Ganges, Jumna, "*Baree Doaab*," and other Cis-Indus Canals, contain 14 (fourteen) grains of mineral matter per gallon, they may be considered as fit for all purposes, save that of irrigation. Water of such purity possesses the property of dissolving out valuable mineral matters present in the soil, which it carries off in solution into the subsoil, beyond the reach of the roots of growing-plants, and as this process is repeated, each time the land is irrigated, the immediate result of each flooding is a diminution of fertilizing mineral matter. The richer the soil, the greater the proportion of mineral matter, and as each successive set of irrigation carries off a certain quantity, the land in a few years loses its original fertility, and after a while suffers a deterioration so great that wheat and corn crops will refuse to grow upon it. But this is not all, for as the impoverishment of the soil progresses, the grain harvested is found to be deficient in most valuable mineral matters, to list, the phosphates of soda, potash, lime, magnesia and iron. These are called the food phosphates, and as the continuous renovation and reconstruction of the wasted, and wasting portions of the animal structure (liquid and solid) depends absolutely on the presence and action of these important substances, their deficiency in the grain, consumed as food, produces poor or impoverished blood, followed by general debility, wasting diseases, impotence, and female sterility. The stamina of the population fails, death lays his hands on the rising generation and waits for the fever season to sweep off the adults of both sexes by the thousand.

The injurious action of canal water having been demonstrated, the question of finding a suitable and practical remedy for the evil complained of, may now be discussed.

The extreme fertility of the Holy Land (Palestine) in most ancient times, is a matter of history, but the reason of this remarkable fertility was unknown by the invading hosts of ISRAEL. Yet it is easy of explanation, for science has taught us that the lands, watered by

the Jordan, and by springs yielding water of the same quality, must of necessity be exceedingly fertile.

The Jordan rises in a grand mountain range, abundantly supplied with limestone, and as a matter of course, its waters are impregnated with lime, with which magnesia is generally associated, and if fossils are present, so is the phosphate of lime. These three mineral substances are the most valuable fertilizers in existence, and the fertility of the lands watered by the Jordan was no doubt due to their presence and agency. It has been proved by analysis (though I regret, Professor Johnstone does not give the details), that a gallon of water taken from the Jordan contains 73 (seventy-three) grains of mineral matter, *in solution*, and as lime, in the state of carbonate, must be the principal component, it is manifest that the poorest soil, if irrigated with Jordan water, cannot help being enriched with a considerable portion of the mineral matters present in every ten pounds of water absorbed by the soil.

The fertility of the waters of the Nile is well known, and from the fact of heavy cotton crops of superior quality being annually raised from lands watered and inundated by the Nile, it is evident that the direct fertilizers are largely present in suspension as well as in aqueous solution.

A consideration of these facts will, I think, convince almost any intelligent person that the purest canal water can only be deprived of its injurious qualities by being artificially impregnated with mineral impurities of a fertilizing nature. Of these, chemically speaking, lime is the most valuable, for it requires six hundred pounds of pure water to dissolve one pound, or 7·000 grains of carbonate of lime. Therefore, if a given quantity of soil is known to contain one pound of lime, the most sceptical person must admit that 1·200 pounds of water will dissolve and wash it out of such soil with mathematical certainty. But if the water applied is itself charged with lime, its solvent powers are checked, and in place of dissolving the lime present in the soil, it will deposit a considerable portion of its own lime, at no great distance below the surface, and part with nearly the whole of it before sinking into the subsoil. If any portion of the lime be in suspension, it will be retained in the soil. In either case the action is due to chemical affinity, for the existence of calcareous clays teaches us that lime and clay will enter into combination, and we know from experience that such soils produce sugar and cotton in the greatest abundance.

A gallon of water cannot dissolve more than 110½ grains of lime, and 13½ grains of magnesia; consequently if a cubic foot of soil contained 30 grains of the former, and 4 of the latter, and the water 80 and 9 grains respectively, no portion of the lime and magnesia present in the soil would be dissolved by such water. In like manner if the water contained 73 grains of lime and the soil 30, the water which filtered through would not be charged with 103 grains of lime, because the clay present in the soil would retain as much lime as it could, and only allow the balance to pass through. Therefore, if only 20 grains of lime were withdrawn from the gallon of water, at such operation, it is evident that the soil in place of being impoverished, is enriched. Hence it follows that if a gallon of canal water can be made to take up even 50 grains of lime per gallon, in solution and suspension, that the lands so irrigated must be enriched in proportion to the lime deposited in the soil.

Before proceeding further I would wish the reader to bear in mind that one cubic foot of pure water weighs 62½ pounds, and as one pound of lime requires 600 pounds of water for its solution, we may, for the sake of simplicity, base our calculations on the rule of ten cubic feet of water (625 lbs.) to the pound of lime to be dissolved. Now, if the soil contained 2 400 grains of lime per cubic foot, the square yard of nine cubic feet would contain 21·600 grains, or 1½ *seers* (3 lbs. 600 grains), and the acre 181½ maunds, or 6 tons 14 cwts. 32 pounds. Large as this quantity seems, it only gives 1½d grain of lime to the cubic inch of soil, to the depth of one foot.

The native zemindar would be driven wild if called on to lime his acre of land to the above extent But, supposing the land naturally contained this quantity of lime per cubic inch throughout the acre, (and most fertile soils contain more), the constant use and abuse of canal water, of which the zemindar thinks he can never have enough will, in time and with the certainty of fate, dissolve the lime out of his land, and once it passes the 12-inch downward limit, or gets beyond the reach of the roots and rootlets of growing plants, he may bid adieu to plenty and prosperity, until he opens his purse strings and applies at least 7½ maunds of lime to each acre of land, under grain crops, and periodically irrigated with canal water.

The Hindoos who burn their dead and, wherever permitted, cast the unconsumed skeleton into the nearest river, stream, or "*nalla*," little know that all water below the locality holds the elements of the human bones in solution, and that the dissolving process will go on until the skeleton is fairly used up. The holy Brahmin, who would sooner die than eat wholesome meat, or drink water from a well in which a bone may have been thrown, for fear of losing his precious caste, thinks nothing of cooking his victuals, allaying his thirst, and washing his oily but sacred person with water holding the elements of human bones in aqueous solution. In further illustration of this subject I will cite a note from "Liebig's Letters." "A fat pig of full size having been wounded, died; it was buried on the slope of a rising ground undrained, and naturally moist, and when the grave was opened after 14 or 15 years, there was found a thin flat cake, white internally, where the body had lain, in length and breadth corresponding to the size of the pig. This I found to consist entirely of fatty acids nearly pure, and it did not contain even a trace of bone earth, (phosphate of lime is so-called by agricultural chemists), its ashes being quite insignificant in quantity, and consisting of carbonate of lime and a little silica, evidently from the external coating. The interior left hardly a trace of ash." From these facts we learn that both rain and river water will steadily act as a solvent, and completely dissolve the phosphate of lime coming under its action. The Engineer Officers of the late Indian army were remarkable for their great intelligence and scientific attainments. The great Durand, and the illustrious Napier, (now of Magdala), Cautley, of Ganges Canal renown, and other Indian or Company's Officers of note, have given us our canals, but as agricultural science, in the days of their manhood was in its infancy in England, it was not possible for them to foresee the evils resulting from the chemical action of potable water, when used for purposes of irrigation. The Canal Officers of the present generation are in no ways to be blamed for the unsatisfactory state of affairs, their duties being connected with the fair and effectual distribution of water, and not with its effects on soils of various degrees of natural fertility. The benefits of canal irrigation were great, and it only requires a little judicious management and expenditure to restore matters to their original prosperous footing.

I, as a practical agriculturist, have shown what the zemindar must do to rescue his lands from approaching barrenness, and as the Government compels him to use canal water, it will have to do its duty by the zemindar, and to supply him with water suited to the purposes of irrigation.

The Sewallick range, not far from Seharunpore, contains untold wealth, in the shape of fossil phosphate of lime, and from Hurdwar to Cawnpore, the Ganges canal is cut through soil, the upper portion of which abounds in good "*kunkur*" lime and "*marl*".

These most valuable mineral manures are available to Government, as Sovereign Landlord, free of cost. The jails could supply convict labour to quarry both, and similar labour might be used in the construction of stout basket work. Crates—made of suitable sized jungle wood. These crates, when finished, should not be more than four feet in height, six in length, and two in width, and therefore capable of containing 48 cubic feet of matter. They will have to be made by thousands and ten thousands, and when ready they must be filled with eight cubic feet of broken fossil phosphate of lime, mixed up with forty cubic feet of lime kunker, *i. e.*, kunkur which will yield lime when calcined.

The crates so charged with mineral matter will have to be deposited in regular order in the canal, so as to be under water, and by being placed close to either bank, will not interfere with canal navigation or irrigation. Smaller crates, similarly charged, will be required for "raj bahas," and water courses. This part of the work accomplished, nature will do the rest, for, the constantly flowing water will dissolve portions of phosphate and carbonate of lime, whilst very fine particles of both will be held in suspension, and as these valuable mineral matters will in due time be deposited over lands under canal irrigation, the evils resulting from the use of pure water will cease and determine, and as a natural consequence will improve after each act of irrigation, the improvement or fertility being greatest, where the soil has been previously limed by the zemindar

The same process applied to other canals will produce like results. But if the water is not improved in the manner indicated, the zemindar will suffer under great disadvantages, inasmuch as the expense of annual liming will be thrown on his shoulders, and he will have to pay for the water which removes the lime out of the soil, and by so doing injures his land, labour, and purse, at one blow.

Trusting your readers will excuse the length of this essay, I subscribe myself as their obedient servant, H.

Note.—"Cultivators have occasionally informed me that the productive powers of their land have fallen off after a few years of canal irrigation." The writer further on observes:—"I am not prepared to hazard any decided opinion with my present knowledge, but I would back first class land, sufficiently watered from wells, against the best canal irrigated fields, at all events, for a crop of wheat." *Vide* letter of "SHEFFIELD" to the *Pioneer*, republished in *The Indian Economist* of the 16th May 1871, page 277-78 "SHEFFIELD" is quite right, and if the land was previously limed, not only would the produce be very much greater, but infinitely superior in quality. H.

EDITORIAL NOTES

MR. MECHI remarks upon the subject of deep and shallow drainage:—"I observe that after a dry summer, the fields drained 5 feet deep at 30 and 40 feet apart, in stiff clay, do not discharge water through the drains so early in the season as those of 30 inches deep, at closer intervals. The reason appears to me to be obvious. The 60-inch drains take the surplus water from 6,000 tons of earth, the 30-inch drains only lay dry 3,000 tons It is easy, therefore, to understand that when the autumnal rains come, the 6,000 tons take longer to supersaturate than the 3,000 tons. The deep-drained lands had only commenced running to-day (January 8th 1869) after the recent heavy rains. Are not those extra 3,000 tons more available for the roots of plants than the same quantity undrained under the 30-inch drains for, the roots of plants descend several feet.—P.S.—One inch depth of earth gives over 100 tons per acre."

THE accompanying letter of Mr. Mechi's is also important and interesting:—

"My best field (1 bushel of seed) yielded 7 quarters 2 bushels per measured acre of fine white wheat (club-headed rough chaff) sold

for 60s. per quarter. My whole wheat crop (73 acres) will average 6 quarters per acre. The pack an acre yields 2 bushels per acre less than the adjoining 1 bushel which was over 6 quarters of white wheat per acre. The pack an acre was put in as late as the 20th of November, which I do not recommend, but was determined to put it in the same day as the rest.

THERE is an interesting correspondence, remarks the *Lucknow Times*, in the last *Gazette of India*, on the results of experiments in the reclamation of "Oosur" land in the North-West Provinces. "Oosur" land is defined as affected by the "reh" efflorescence, in other words by the periodical deposition of saline incrustations on the surface. Lands so affected are left barren by the cultivators, and except when salts are manufactured from solutions of the surface scratchings, they yield no profit to the proprietors. Two sorts of experiments have been tried for their reclamation. The most successful of these would appear to be that of digging very deep under the surface and throwing up soil not affected with "reh." The other is that of deep, thorough drainage. Both of these experiments have been tried with some success, and it is recommended that the subject should receive further attention. We have no doubt some of the landed proprietors in Oudh might be persuaded to undertake experiments so simple as these described. "Reh" is simply a generic name for all saline efflorescences, consisting sometimes of an impure sulphate or carbonate of soda (khar), sometimes a *bonâ fide* chloride of sodium (common salt) and sometimes carbonate or nitrate of potash (sujji), but generally a mixture of these. The word "reh," however, is applied, at least in Oudh, to salt of potassium only.

IN consequence of the introduction of the metric system into Turkey, the population, we are told, is thrown into confusion. Tahsin Effendi, a member of the Ulema, and late Director of the University, has invented a simple card, bearing a circle and moveable bar. The circle is divided into two halves, one bearing the old weights, and the other the new; on placing the pointer to an old weight, the other end at once shews its equivalent in the new weights.

THE Canadian correspondent of the *Scotsman* says:—"The prospect for the crops this year is very good on this Continent, and especially so in the west. In Canada, the fall and spring wheat look remarkably well, and promise an abundant yield. The weather is uncertain—to-day tropical heat, to-night unseasonable coldness, but very little damage has been done by the sudden changes either to fruit or field produce. A wide breadth of wheat has been sown this year in anticipation of high prices growing out of the requirements of Europe. Indian corn is a little backward for the season, but has yet abundant time to bring up. Oats promise well, though in some places they have been injured by long spring droughts. These are evils of almost regular occurrence in some part or other of Canada, more especially in this (the Ottawa) district."

"CAN an Englishman own land in America if he purchases it from private parties instead of from the Government? So asks an intelligent correspondent. Yes. Land is bought and sold in America, just as horses, or cattle, or coats, or boots, or cords of wood are in England. Whatever a man owns in America, he owns entirely, and can do what he likes with. And an Englishman who buys American land, and pays for it, enjoys the same privileges. As every child of a family inherits an equal share of the estate, there is no danger of property accumulating in masses as in England. When a rich man dies, his land and personal property are held in charge by the State in which he lives, until his children are of legal age, and then the State sells the property to the best advantage, and divides the proceeds equally among the heirs. It is the same with a poor man. If a responsible executor is appointed, the State interferes only to the extent necessary to see that none of the children are defrauded. —*The Free West.*

2 Dec.

THE *New York Tribune*, referring to farming in the west, mentions that a Mr. Sullivan has, in Livingston county, Illinois, a farm 6 miles square, containing 40,960 acres—64 sections Government survey. This vast tract is subdivided into 32 farms of 1,280 acres each. "Each farm has a Captain and a First and Second Lieutenant, all under control of a Commander-in-Chief. There are 15,000 acres under the plough, over 10,000 of which are this season in corn, which looks superbly. The whole of the land was taken from the Government by the present owner some 20 years since at 1 dol. 25 cents per acre, and is now worth, with the improvements made upon it, at least 2,000,000 dols." The same journal, speaking of the immense scale on which cattle-raising is carried on in Texas, states that the entire number of cattle owned in Texas is nearly 4,000,000, while New York State, with her 4,000,000 of population, eight times greater than that of Texas, has less than 750,000 head of cattle.

AMERICANS are out-stripping themselves in the way of mechanical contrivances.

"Mr. John Scott, of Brooklyn, New York, is building a waggon to run by air or steam. It is 10-horse power, with three cylinders 8 by 5, and is self-sustaining. The cylinders work three piston-rods and two follower heads. The wheels are of Moaks' patent, and are beautifully constructed, the hubs being composition and the spokes dove-tailed in the hubs, which makes them very durable and strong. It is intended to plough, sow, reap, mow, cultivate, and roll. It is so constructed that all the farming implements from the main waggon can be detached. Mr. Scott proposes taking it to Missouri, where he will use it on his own land. All farmers who have seen it during its construction express the opinion—that it is what has long been wanted, and is of such a construction that every farmer can work his land by air or steam power, which is 50 per cent. cheaper than by mules.

"IT is related of an English farmer that he condensed his practical experience into this rule:—"Feed your land before it is hungry: rest it before it is weary: and weed it before it is foul." These words should be written in the heart of every man who desires to farm, and may go far to answer the question so frequently and so anxiously asked, does farming pay? The rule demands the exercise of the qualities needful for success in every occupation, untiring watchfulness and prudent care, knowledge, forethought, energy and economy, regularity, attention to little things, personal supervision and observation—this latter, a power requiring education and constant exercise. It may not be altogether amiss to say that this power of observation, although named last, is perhaps the most important to a farmer. In this wondrous world, this panorama, as it has been called, of thought and action, of forces, currents, growth, decay special beauties are presented to the agriculturist, but, alas! while many see, few observe. Millions see only and never acquire the habit of detecting good in what they see, so as to use it; or of evil so as to shun it. It is this power of observation, trained, exercised, which in agriculture has done so much, it has reclaimed exhausted lands, fertilized barren soil, improved tools and machinery, and raised the value of stock. To this may be traced the development of agricultural chemistry. The phenomena of vegetation, and the chemical constitution of substances had previously been observed. To young men about to enter on the noble profession of agriculture, the foregoing is of value. Too many enter on its pursuit with the idea that it is easily attained, that success is an affair very much of chance, of weather, of cheap or dear land, or of market values for products. While doubtless, there is an element of truth in such thoughts, it ought to be ever borne in mind that no occupation requires more constant exercise of mind and body; that the better and educated the farmer is, the more he maintains and increases his knowledge; the more he becomes acquainted with natural and physical science, the more his reasoning faculties will be aroused, and his ability to observe increase. His observations should be recorded and studied. There

is great practical utility in the well-known saying of Captain Cuttle, "when found, make a note of." With this enhanced power to observe, and to reason on the matters observed, the farmer will be in a better position, not only to follow the simple rule already given, but by taking avail of any of the adventitious circumstances named, he will elevate his noble profession and himself."—*American Paper.*

"At a time when so much is written on the subject of emigration, when our agricultural labourers are so continually allured by fairy visions of high wages and discomfort to leave fair wages and comfort, and when our farmers are exhorted to give up the position they now occupy, sometimes rather an unenviable one, we must confess, through uncertainty of tenure and excess of game to become landlords in some dismal swamp out west, it is pleasant to read such a pamphlet as has just been written by Mr. Robert Donnell, of Dublin, entitled "Farmers, their own Landlords" : A plain tract for plain people, shewing how tenants may get "Farms Rent Free." This publication has been written to illustrate some features of the Irish Land Act, which the writer supposes have not attracted much public attention, viz., the purchase clauses of that Act. The object of those clauses is, by the aid of Government loans on easy terms, to enable farmers to become their own landlords.

"In Ireland, under this Act, a tenant can borrow the larger portion of the ascertained value of his farm from Government, which is repayable in a term of years. Thus, A. occupies a farm for which he pays an annual rent of £32-8s., the estimated value being, say £750. He can borrow from Government £500, and thus, with £250 of his own, he completes the purchase. Government asks that its loan of £500 should be repaid by annual instalments of £25. In a period of thirty-five years the debt, principal, and interest is then extinguished, and the land belongs to A. and to his heirs for ever.

Formerly, he would have had to pay as rent £32-8s. This now ceases, and payments are as follows :—

Head rent	£	3	10	0
To Government	,,	25	0	0
	£	28	10	0

or less by £3-18s. than formerly paid.

It may however be asked, supposing A. has to borrow the £250 requisite, in addition to the loan from Government, to complete the purchase, how will his annual payments stand?

The question is answered thus :—

Head rent	£	3	10	0
Government	,,	25	0	0
Five-per-cent. interest on £250	,,	12	10	0
	£	41	0	0
Former rent	,,	32	8	0
Increase of annual payment	,,	8	12	0

But if, on the other hand, A. has possessed £250, for which he would receive from the bank, on an average, 2 per cent. per annum as interest, his position would be as follows :—

Head rent	£	3	10	0
Annual payment for 35 years to Government	,,	25	0	0
Loss of interest on £250	,,	5	0	0
	£	33	10	0
Former rent	,,	32	8	0
Increase of rent or charge	£	1	2	0

Of course, the foregoing calculations would result more favourably for A., the less he had to borrow from the Government, and the more he had of his own. The Irish Land Act, if for no other than the purchase clauses of which this case is an example, is a priceless boon to Ireland; and Mr. Gladstone, Mr. Bright, and the Liberal party may well be proud of their legislation in this respect. But while thus congratulating Government and the country in their endeavours to heal the wounds inflicted "during centuries of wrong" (to use an O'Connellism) on the Sister Island, we are led to ask if such an Act would not, in many respects, do good in Great Britain. Probably, such an Act for England and Scotland, modified to suit the different circumstances of the countries, would be productive of good to the farming interest, and in many instances, we believe, it would be of benefit to the owners of land. At all events, it might do much to soften the acrimony displayed by agitators on the land question, as opportunities would be given, whereby the number of landlords would be increased. What we desire is a modification of the laws of entail, and greater facilities for the easy transfer of land, such as are given by the Act under consideration. Under its provisions transfer is made by simply changing a name on the record, thus avoiding that worst of all human ills—an Attorney's Bill."

ENGLISH FARMING:

IRRIGATION AT STOKE PARK.

For many years we have recommended Mr. Brown's system of irrigation; it is much more worthy of our commendation now that he has placed his pipes below the ground, where covetous hands cannot steal nor horse-hoofs hurt the pastoral life-diffusing lead. We have received a report, the truth of which is attested by the owner of the farm, Mr. Coleman, which we subjoin. After personal inspection, we hope to give a fuller account next week.

This system of irrigation was laid down in the end of August 1870, upon 20 acres of pasture land, with a soil chiefly composed of a silicious clay, slightly calcareous, but from a want of loam, mould is liable to become crust-bound in dry weather; it is, however, rich in the mineral constitutents of a productive soil, and may be classed with that of the well-known brick earth of slough. On the 5th of September, with temporary engine power, watering was commenced, the land was top-dressed with the British Rivers. Irrigation manures and irrigation was continued at night until the end of the month. Notwithstanding the lateness of the season, the soil dried up, and vegetation having disappeared from the surface since the previous June, yet on the twenty-third day after watering, a very thick set growth of about 9 inches of superior feeding grass was produced, and by the middle of October it became a large crop, which was cut and given to stall feeding cattle, and the land after was successfully grazed with sheep until the end of the year, while the adjoining pasture unirrigated, and in every other particular the same as that over which the irrigation had been conducted, remained unproductive, although rain to some extent had fallen during the autumn.

The value of the cut grass and the grazing upon the irrigated land may be estimated as equal to that of an average crop of turnips, as such grass, weight for weight, is equally rich in beef and mutton constituents, or its money value may be fairly put at £5 per acre for an autumn crop. In the spring of this year (1871), from delay in erecting the engine and pump now upon the irrigated land, operations were not commenced until the last week in March, and from five to six weeks of the best spring weather for watering and utilizing manure were lost in consequence, yet a very large crop of hay, chiefly perennial rye-grass was fit for cutting by the second week of May.

It was estimated by practical judges to yield 2½ tons per acre, and from its having been secured in fine condition without getting any rain, it became the best description of good horse hay, and at the present July market price, its value in London is not less than £7 per ton, as hay not equal to it has been sold during this and the last month from £8 to £9. On cutting this crop, a portion of it on the same day was removed and made into hay with that upon the unirrigated land, which gave facilities for at once watering the ground from which it had been taken. This had the effect of producing a second crop of perennial rye-grass of a large growth, which was fit for the scythe in the second week in July, such a result is, as a rule, unknown to agriculturists. A portion of the ground was measured, and the grass weighed, gave a yield of 12¾ tons per acre, or about equal to 2½ tons of hay; while the unirrigated land, which had its first crop cut on the same day as the irrigated, only gave one-fourth of this weight as a second crop, although much rain had fallen during its growth, in the absence of which a mere fraction of this would have been the result; proving that even in a season such as 1871, the coldest and wettest (from April to August) there has been since 1862, that this system of irrigation has a three-fold advantage over any ordinary means pursued by agriculturists in the cultivation of grass or hay. This arises from the facilities given by the system for tempering the soil, and utilising manure by the necessary moisture for promoting a perfectly developed and large growth, and from the operation of watering being conducted during the night, at such a trifling cost, a continuous process is secured by its application from March to November. The quality of such grass being suitable for the production of beef and mutton, without help from "feeding stuffs," is guaranteed, from the fact of its having been made at Stoke Park into the best description of hay; and this to the intelligent grazier, will be sufficiently convincing that it is not to be classed with such as that obtained by the "flooding system" from "water meadows," or that produced by "sewage irrigation."

The successful results obtained at Stoke Park by the British Rivers' Irrigation, since last September, undoubtedly warrant the step just taken by Mr. Coleman, in extending it over the whole of the pasture land upon his estate, to the part of the 20 acres put down last autumn. The under-ground system of the patentee has been adopted over the whole of it, and is one which recommends itself for every description of cultivation. Its distribution of moisture is that of a perfect rain shower, according to the power used over several acres simultaneously; and hundreds during the night, by the superintendence of an engine-man and a tap-boy, can be perfectly watered even during the hottest weather. The whole of the plant of which the under-ground system is composed, once laid down is, so to speak, as permanent as land: it is perfectly secure from injury in the grazing of sheep, cattle, or horses, and will not interfere with steam or the ordinary means in use for the cultivation of land. There is nothing to be seen above the surface which renders it peculiarly adapted for the watering of parks and pleasure grounds, and from the quantity of water necessary for irrigating being small, there is no place which possesses a well-spring with ordinary resources for storing the water during autumn and winter, but will enable its proprietor to irrigate many acres of land upon this system.

The estimated value of the produce upon the irrigated and unirrigated land, appended to this report, is for the cut grass and grazing of last autumn, with the hay crops in May and July of this year, which stand as the value for a seasons' growth. It may be considered that the unusually high prices in June and July for hay gives an exceptionally high value for the produce of an acre, but if put at the average, £4-10s. per ton for the last five years, and take into account the want of an average temperature for conducting irrigation during the spring and summer months of this season, undoubtedly one of the coldest there has been for the last ten years, with the lateness of commencing the irrigation at the end of March instead of the middle of February—will sufficiently account for the loss of from 1 to 2 tons of hay; this, added to that obtained and taken at £4-10s. per ton, combined with the autumn grazing from August to November, would amount to not less than £35, and is not overstating the value of an acre of irrigated land, from similar results having been obtained by this description of cultivation.

The item for fuel and superintendence in the report (30s per acre) is 50 per cent. more than it would have been, had 100 acres been under irrigation. The consumption of the fuel would not have exceeded 5 lbs. per horse power per hour, and for twelve hours' working during one hundred nights (about the average time necessary in a season) with coal at 15s. per ton, is under 5s. per acre, and the wages of an engine-man at £1, and a tap-boy at 10s. per week, from February to the end of September, and charging the whole of their time against the irrigation, is under 10s.: but the same superintendence with adequate engine power would work 500 acres in the same time and reduce this item of 10s. to 2s. and with a further saving of fuel, which would undoubtedly be obtained, the amount 30s. for it and superintendence, would then stand at 5s. to 7s. 6d. per acre, while that for manure, in comparison with the amount named in this report, would, for grazing and cropping, be reduced by one-half. The item for dung costing 10s. per load, includes the cost in London, cartage to, and with 20 miles of railway carriage, 2½ miles cartage to Stoke Park, labour in turning over the manure during its being further decomposed, cartage to, and spreading upon the land, and estimated value for the loss of weight, the manure sustained by the time it left London in August 1870, to January 1871, is an expenditure for manure upon the surface that no other system of cultivation, taking the risk of the weather, could have shewn a profit upon, such as the British Rivers' Irrigation has shewn at Stoke Park during the present season.

Particulars of value of produce and cost of production of grass and hay upon the irrigated and unirrigated land in Stoke Park:—

UPON THE IRRIGATED LAND.

Cost of production per acre.

Interest upon plant at 5 per cent.	£ 1 10 0
Superintendence and fuel	1 10 0
Cost of top-dressing with British Rivers' Irrigation manure, September 1870	2 10 0
Ditto, with London horse and other dung spread upon the surface, 10 loads at 16s.	8 0 0
Ditto, with British Rivers' Irrigation manure in March 1871.	1 16 0
Ditto, in May 1871.	1 4 0
Cost of making first and second crop of hay	2 10 0
Per acre	19 0 0

Value of produce per acre.

Value of first crop of grass and grazing autumn, 1870.	£ 5 0 0
Ditto, spring crop of hay, 1871, 3½ tons at £7	17 10 0
Ditto, summer crop of hay in July, 2½ tons at £7 ..	17 10 0
	£39 0 0
Loss by cost of cultivation per acre	19 0 0
Balance in favour of produce	£20 0 0

UPON THE UNIRRIGATED LAND.

Cost of production per acre.

Top-dressing with British Irrigation manure, February 1871	£ 1 16 0
Ditto, in May	1 4 0
Cost of making first and second crop of hay	2 0 0
	£ 4 0 0

Value of produce per acre.

Produce from June to December 1870—No value.

Hay crop cut in May 1871, 1½ tons at £7	£10 10 0
Ditto, in July, fourth of the irrigated crop of 2½ tons, at £7	4 7 6
	14 17 6
Loss by cost of cultivation per acre	5 0 0
Balance in favour of produce	9 17 6

Since irrigation was commenced upon the under-ground system for the autumn grazing at Stoke Park, in the second week of this month, favourable weather with a high temperature has prevailed, and an extraordinary large growth has been produced upon the irrigated land, considerably more than that obtained for a similar period during the months of May, June, and July of this season, while the whole of the park and hay land, unirrigated, are at this date scorched and dried up

THE SURFACE-MANURING OF WHEAT AND GRASS CROPS.

The present being a suitable period for applying ammoniacal manures to autumn-sown wheats, young grasses, and clovers, and meadows, a few practical suggestions as to the use of these manures may prove of benefit to farmers. Some persons may be deterred this season from purchasing these manures for surface application, owing to the comparatively high prices at which they are vended. The price of sulphate of ammonia is higher than it was in previous years. This has arisen owing to the demand for this fertiliser. In the case of Peruvian guano, from the great variations in quality and the general inferiority compared with the shipments of previous years, the ammonia furnished by this manure is uncertain in amount, and may otherwise be procured at a cheaper rate. Nitrate of soda is relatively cheaper than Peruvian guano, and the supplies apparently sufficient to meet any extra demand. The question, however is, will agriculturists be repaid for the outlay necessary to procure a sufficient quantity of one or of all these fertilisers for surface-manuring? There is sufficient evidence on record to show that a liberal use of ammoniacal manures, such as nitrate of soda, purchased at higher prices than those at present ruling in the market, is a profitable expenditure of money—the increase of grain, straw and hay, more than repaying the outlay. No doubt the question of profit or loss depends in some measure upon the price of grain after the manure has been applied to a grain crop, and in the case of manures applied to grass and meadow lands upon the price of hay. The experiments in growing wheat conducted in the county of Norfolk and recorded in the English Society's *Journal*, proved that an application of 1½ cwt. of nitrate of soda to the acre, gave an increase of from 6 to 7 bushels. There are also recorded in that Society's *Journal*, numerous experiments which prove that the pecuniary benefits arising from a liberal use of ammoniacal manures to grasses and clovers intended to be cut for hay are so considerable as to warrant their more general use along with other fertilisers. We know of unrecorded experiments which bear out an estimate, since made, that 1½ cwt. of nitrate of soda will generally increase the produce of hay made from a mixture of rye grass and clovers about 50 per cent., or about one ton per acre.

There are several reasons why farmers should not hesitate this season to top-dress nearly the whole of their wheat and young grass fields. It will at once be apparent to almost every farmer that autumn-sown wheat at the present time are backward in growth, and not a few fields are deficient in plant. Hence the necessity for the plants being stimulated by ammoniacal manures, so that in thin planted fields they may tiller and in both cases may form vigorous stalks. Judging from the present prices of wheat, and the accounts received from the Continent, more especially France, the wheat crop of Europe, in the ensuing harvest, will not exceed, if it reaches, an average. In France there is a much smaller area than usual under wheat, while in the forty departments which have been overrun by the German army the damage done is stated to be very great, especially in some of the best corn-producing districts. Not only have the wheat plants been trampled down, but a large portion of the land is still unseeded. Such lands can produce almost no corn. Besides the injuries arising from the inroads of the hostile armies, the severity of the frost experienced during the winter partially killed over a large area in the north-eastern departments, the wheat plants, and re-seeding with wheat has not generally been adopted. In England, the injury arising to the wheat fields from the severity of the frost has been so far mitigated by the very general sowing, recently practised, of Talavera and other early varieties of wheat.

All these circumstances, therefore, do not justify anyone in anticipating that the ensuing year will be one of cheap corn, more especially of wheat.

As regards the hay crop, the high prices which have been ruling in England and France have tended to diminish the amount of hay in Scotland. Although the prices have been comparatively high, considerable shipments have been made from ports in the Firth of Forth to French ports—the prices, delivered in France, being in some instances upwards of £9 per ton. The hay forwarded to England has generally been sent by railway. The amount of the hay crop of 1870, available for supplementing that of 1871, is necessarily unusually small; and the inference from this state of matters is, that prices will be rather above the average.

With these preliminary remarks, we proceed to give a few plain directions as to the application of manures to the surface for stimulating the growth of wheat and grass.

Nitrate of soda and sulphate of ammonia may be used separately at the rate of say 1½ cwt. per acre. A mixture, however, of nitrate of soda and sulphate of ammonia will generally prove more effective than an application of either of these manures singly, particularly if the land is situated in a somewhat moist climate. Common salt, at the rate of 3 to 4 cwts. per acre, may be added to the ammoniacal manures. If the nitrate of soda and sulphate of ammonia are to be mixed, they should be thoroughly incorporated and applied at the rate of 1½ to 2 cwts. per acre. In those cases where the fields are thinly planted, light harrows may be passed over them after the manure has been applied, a roller following the harrows to compress the loose earth at the roots of the wheat plants. If the surface soil, however, is very loose, harrowing should be avoided, and a heavy roller, such as Crosskill, passed over to compress the surface, so that the wheat plants may not wither under the influence of drying winds and alternate frost and thaw. In districts where the climate is humid, and the rainfall during the summer considerable, a mixture of sulphate of ammonia and guano from the Cincha Islands may be used to top-dress the crop in the proportion of 1 cwt. of sulphate of ammonia to 2 cwts. of guano to the acre. If first-class guano cannot be obtained, 3 or 4 cwts. of good superphosphates may be substituted with advantage. As a rule, after manures have been applied, the fields should be rolled.

In all cases where manures are applied on the surface to grain crops, it is advisable that one or more portions of the field should be left undressed, so that the actual results may be ascertained.

Young grasses and clovers, when in a growing state, quickly show the fertilising influence of ammoniacal manures, especially when the weather is damp and comparatively mild. It will generally be found profitable to top-dress young grasses which are to be depastured by sheep, as by this means the fields will keep a greater number of animals during spring—a time when food is scarce, particularly grass.

It is, however, when the grass crop is intended to be cut for hay that surface-manuring will prove most profitable. A mixture of nitrate of soda and Peruvian guano is generally to be preferred to either substance applied singly. Much, however, depends upon the situation of the field and the character of the weather during the months of May and June. Nitrate of soda or sulphate of ammonia appears to act more powerfully upon the young grasses than upon the clovers, while Peruvian guano stimulates the growth of the clovers as well as of the rye grass. Superphosphate of lime can often be substituted with advantage for Peruvian guano—the same money-value being applied per acre. An application of 1 cwt. of nitrate of soda, and 2 cwts. of Peruvian guano will cost from 45*s.* to 50*s.* an acre, being rather more than the average value of half a ton of hay. But as the increase in the weight of hay is seldom less than one ton per acre, the expenditure on manures will almost invariably be repaid—always provided the season is suitable for the action of these manures—that is, comparatively moist and mild. When the season is unusually dry and arid, the growth of both clovers and grasses is necessarily stunted, particularly that of the latter. This was the case in many districts last season, both in Great Britain and in Northern Europe generally. But in such seasons the market price of hay is usually above the average, and consequently, although the increased weight of hay may not come up to the expectation, the profit from the application is usually sufficient to warrant a more general adoption of the practice of top-dressing young grasses.

As regards meadows intended to be cut for hay, surface-manuring generally proves most profitable. The growth of grass is not only largely increased, but its nutritive qualities are augmented. The quantities of ammoniacal substances may be almost double the quantities allowed for young grasses. An application, therefore, of 2 to 3 cwts. of nitrate of soda may be used, or an equivalent quantity of sulphate of ammonia may be put on to force a luxuriant growth of the natural grasses. Phosphatic manures almost invariably exercise a marked influence on meadows, particularly when applied to those which have been occasionally cut for hay, and on which dairy stock have been depastured. Ground bones and bone-meal, or superphosphate of lime produced from bone-ash, will generally be found the cheapest source of phosphoric acid for application to meadows. Superphosphate of lime manufactured from mineral phosphate is more suitable for comparatively light soil than for clay loams. The quantity applied may vary from 3 to 5 or even 10 cwts. per acre.

PHOSPHO GUANO.

The application of which to various cereal and root crops in this country has been attended with success is now, we understand, about to be applied in "fresh fields and new pastures." The Directors of the Phospho Guano Company, (Limited), thought the guano would be a useful stimulant for the tobacco plant; but not wishing to describe it as such without competent authority, submitted it to the test of Professor Voelcker, Chemist to the Royal Agricultural Society of England. His opinion (which, it will be seen, fully bears out the idea of the Company as to its value in tobacco culture), dated the 26th August, we have now the opportunity of giving. The Professor says:—

In reply to your inquiry respecting the use of phospho guano to the tobacco plant, I beg to inform you that, in my judgment, phospho guano is a valuable fertilizer, which may be used with much advantage by Cuban planters.

It is no longer a matter of theory, but a well-established fact that manures rich in readily available phosphates improve the quality of every description of agricultural produce, and hasten the maturity of our crops.

I do not hesitate therefore to say that a manure so rich in soluble phosphates as phospho guano, will have a most beneficial effect upon tobacco, especially when grown on naturally unproductive soils, or upon land which has been too abundantly manured with animal organic matters, Peruvian guano or ammoniacal salts.

An excess of nitrogenous or ammoniacal compounds produces heavy, but imperfectly ripened coarse crops of tobacco. Phospho guano, on the contrary, promotes early maturity and a fine leaf, and thus it is particularly valuable when the planter aims to produce quality rather than quantity.

On light land, which has been much exhausted by the constant growth of tobacco, I would recommend phospho guano to be mixed with muriate or sulphate of potash in equal proportion, and if the planter wishes to grow rather a heavy crop than tobacco of the finest quality, he may, with advantage, use nitrate of soda and potash salts in addition to phospho guano.—*The Farmer.*

SEWAGE UTILIZATION.

Mr. Mechi writes to us describing a visit, on Thursday, to Mr. Hope, Breton's Farm, at Hornchurch, 3½ miles from Romford, from which town all its sewage flows through an 18-inch iron pipe, Mr. Hope paying to the town 2*s.* per head or £600 per annum, for 6,000 inhabitants using closets: and the cost of the town of raising all the sewage 25 feet at Mr. Hope's farms is, including coals, engine-driver's wages, and interests and wear and tear of engine, about £300 per annum. Mr. Mechi says:—

"My last visit to this farm, as recorded in your columns, was in September. Ever since then, in all weathers, the sewage has flowed constantly on the land, which consists of 120 acres of poor gravelly and sandy soil with occasional veins of stiffer soil.

I saw the engine-driver and farm men looking as healthy as need be, although he and the four sewage regulators are for ten hours a day in almost immediate contact with the sewage. There was the black sewage flowing over the land, and after passing through it to the drains, 5 and 6 feet deep, coming out as clear as the finest spring water. The day was very warm, so we all had a hearty draught of it without any inconvenient result. Mr. Hope uses it over again mixed with sewage, except when there is heavy rain. It thus appears that, in his case, the flood or rain water mixed with the town sewage does not over-dilute it, although the question is arising whether the sewage and flood waters of towns and cities should not be separated. I presume that would depend upon the nature of the soil to which it is to be applied, and also to the amount of town water supply. Every crop on the farm was looking the picture of healthy and abundant growth, and it was wonderful to see French beans growing on a portion of the land that was almost pure gravel. The temperature of the sewage during frost being many degrees above freezing, the irrigation after a night's frost melts the ice in the ground and enters the soil. Onions, carrots, cabbages, potatoes, strawberries, &c., were all promising, and a second cut of Italian rye-grass, 2 feet to 3 feet long, gave unmistakable evidence of the value of town sewage as a producer of food for man and beast. We are much indebted to Mr. Hope for permitting, so liberally, a view of these interesting proceedings. The Romford sewage amounts to about 250 gallons per minute, average of day and night. The engine, therefore,

pile on about 600 gallons a minute for ten hours. The engine-driver has 4s. a-day, and the engine consumes 11 cwts. of coal per day. The parish authorities attempted to rate Mr. Hope on the amount he paid annually for the sewage, but on his saying that he was content with this, provided they rated all the other farmer's and market gardeners on the cost of their manure, they saw the impropriety of it."—*Times.*

AMERICAN AND ENGLISH FARMING.

THERE are Americans who do not think that their country can "lick creation," who grumble, in fact, and make "odious comparisons" of themselves. Take, for instance, the following, by "G. G.," who writes to the *Albany Country Gentleman* :—"The agricultural condition of both countries should be dispassionately considered, and the difference of the customs accounted for, after which the prices made at the present day and in times past may be compared to shew what reason there may be to complain.

There cannot be any cause for grumbling in the east, for everything grown has a ready market, and all kinds of meat and dairy produce are making proportionately more than hay and grain, which state of the market is a premium for good farming: consequently, any man having capital or credit to obtain live stock, must be weak in his upper story if he sells aught for which he could make more by manufacturing it into meat or dairy productions.

Butter was sold in Orange county since 1860, at 16, 14, and 12 cents per lb.; and previous to that date it never went over 20 cents per lb. Cider was 2 dols. per. barrel, and I bought a first-rate hind quarter of beef at 4½ cents per lb.; and a year or two after, on Long Island, I bought the same quality for 6 cents. Now, the price of meat and butter is almost treble, and there are men to be found in the State of New York who reduce their live stock to sell hay. Can this be possible? some people may say. In days past pork was proportionately low in price, yet though the feeding of pigs, thoroughly fat, gives the greater quantity of the richest manure for the farm, how very few hogs are fed in the east. The western men who cannot get much more than half what the eastern men can sell theirs for, supply the great bulk brought to market—in fact the far western farmers do not obtain half the price for their pigs. Again, the English farmers buy American corn to help to feed their bacon, thus manufacturing what the American farmer impoverishes his land to grow and send to England, into manure for land as well as into meat for sale, and what makes it more surprising is, that the land the American exhausts and completely wears out, is his own, while what the Englishman improves and so highly fertilizes, is held only from year to year under his landlord. Does not this look very extraordinary? How can any intelligent man account for such incongruity?

An English tenant-farmer, paying a money rental half yearly, and liable to be noticed out by a six-months' notice, buys corn, brought 3,000 miles, to fatten animals, chiefly for the sake of the manure. An American Yeoman, owning his land and possessing capital to invest in other speculations, and in some instances living in first-class style, sells his hay and feeds no animals for the purpose of enriching his own property, the same as the English tenant does that of his landlord.

Let any sane man dwell on this subject a few minutes; in the first place, it proves that confidence, unusual in any other country, is exhibited by the English tenant, and consequently there must be more honour and nobility in the aristocracy of England than minds devoid of these qualities consider possible, and on the other hand, there must be little patriotism in any man who will set or follow such an example. For any man to sell hay at 15 dols. per ton, corn at 1 dol. 25 cents per bushel, &c., &c., growing no nutritious winter food, and his land requiring manure, seems imbecility.

You cannot argue with such men. They have no perception, "they have eyes, but see not; and ears, but hear not;" and the blind continue to lead the blind and will, till the country is ruined, and then what an up-hill fight it will be to regain the vitality sold out of the land! It is deplorable in the extreme to contemplate the evils inflicted by the present generation on future agriculturists.

Farming cannot pay where the land is so poor as only to grow half crops, and there are not half crops grown on much of the best land in the eastern part of the American continent, and on at least half of it, the crops do not yield one-third of what they would with a renovating system of farming.

The expense of cultivation would be little more under a good system than it is now; there would be more labour in harvesting, three times the bulk of grain and corn, of course, but let any of those farmers who do not like to see such writing as this in a newspaper, say whether there would not be more prospect of remuneration with three-fold crops, even though the expenditure is doubled. But when the farms are in a fertile state, when the land has been brought into a state to grow 75 bushels of corn per acre instead of 35, and grain, &c., to a comparatively increased yield, by the manufacture of most of it into meat, pork, &c., the cropping can be repeated oftener, so that not only will there be 75 instead of 35 bushels per acre, but the number of acres on the same farm can be doubled, as there will be such a vast increase of manure.

I have grown white turnips on this continent which had bottoms large enough to feed to hogs in July, which in hot weather are a wonderful help when given raw, just as they are carted from the field; clover can be given previous to this time, and with a moderate quantity of corn or grain, the hogs will grow as fast again, and feed with the growth, for this vegetable food is what is wanted for pigs of any age to keep them healthy, and make them pay for feeding. Roots are required in this country quite as much as in England; they can be grown and fed on the land in the months of September, October, November, and a part of December, and in the north there may be very fine white turnips for aught requiring them all through August. Do not let anyone say this is theory, for there is positively nothing stated here, or in any of my writings, which I have not carried out myself, or which I cannot practically illustrate again.

There is another matter to mention in the agriculture of America and England, which is of very much more importance than some may imagine; it is the age at which animals are fed for the butchers. Cows and ewes are kept in the herd and flock too long, for it is very bad policy to fatten old cows or ewes; it takes more to feed them, and when ready for market they make less money. English farmers are very particular in this respect. With swine, the error in America is in not making them heavier weights, for if farmers would fatten from the time of birth, instead of half-starving pigs the first six months of their life, every one of the pigs only weighing 200 lbs. would be 400 lbs. or more.

STEAM CULTIVATION.

THE following is the full text of the Memoranda made by Professor Wilson, of the Edinburgh University, and Mr. P. R. Swinton, Holyn Bank, upon the working of the Thomson engine and Fiskon's system of steam cultivation, to the Highland and Agricultural Society of Scotland. They will be read with interest at the present time:—

The ploughing took place in a large field at Dunmore Park, which had lain about 40 years in grass, and was nearly level The soil was a strong clay, and in good order for ploughing. The engine is of 8 horse-power, and weighs 7½ tons, with vertical boiler and cylinders. It runs on three wheels with India rubber tyres, each 2 feet broad, and covers a space 7 feet wide. The steam-gauge, when the engine was drawing the plough, indicated a pressure of from 120 lbs. to 125 lbs. per square inch. Five cwt. of coal and 700 gallons of water are stated to be consumed in a day of nine hours. The plough is a balance-plough, made by Gray, of Uddingstone, and is the first of the kind which has been constructed. The plough had three mould-boards. The engine travels on the unploughed land, dragging the plough behind it. The length of furrow was 12½ chains, or 275 yards. The furrows made by the plough were 6 inches deep by nearly 9½ inches broad, and were fairly turned, considering that the ploughman had not much experience of the work. A heading, 20 yards wide, was left at each end of the field for turning the engine. To travel the distance of 275 yards and to turn the engine, and attach it to the plough ready for the return journey, occupied a space of eight minutes; and this required considerable activity on the part of the engine-driver, when turning the engine. The engine was driven by one man, with a boy to attend the fire, and watch the pressure and water-gauges. The engine carried a supply of coals sufficient for four hours' work and four hours' supply of water. The plough was steered by one man, whose duty also was to hook and unhook the engine to the plough at the commencement and end of each journey. At the rate at which the engine and plough were working, viz., three furrows, 28 inches wide, and 275 yards long, or 214 square yards, in eight minutes, the time required to plough an imperial acre was within a small fraction of three hours; and supposing the plough to work nine hours a day which, taking the average length of days in the ploughing season, is a full allowance, it would turn over 3 imperial acres per day, or about what three pairs of horses would have done. It was observed that while the three ploughs turn over a space of 28 inches wide, the engine-wheels cover a space of 7 feet wide, so that the wheels of the engine pass three times over the land before it is turned by the plough. It was also noticed that the engine passing over the land depressed the surface about 1½ inch, and the soil was also compressed to this extent. The Highland Society's self-registering dynamometer, made by Messrs. Easton, Amos; and Anderson, of London, was tried on

the engine and three-furrowed plough, and indicated a draught of 21 cwt. A common swing-plough, drawn by two horses, was tried to ascertain the difference in draught on the land in its natural state and where the engine had passed over, and it was found that the land, where compressed by the engine, required an additional power equal to the draught of 1 cwt. the single plough making 6 cwts. on the unpressed land, and 7 cwts. on that which the engine had passed over. The committee were desirous of seeing the engine and plough at work on stubble or ploughed land, but Lord Dunmore had no field on which it could be shewn. The committee would also wish to see the engine and plough tried in a field with considerable slope. Lord Dunmore handed to the committee the following statement of the cost of his apparatus, and of the daily expenditure in working it :—

Cost of engine, 8-horse power	£700	0	0
Cost of ploughs, three-furrowed	70	0	0
Cost of water tank	30	0	0
	£800	0	0
Interest on 8-horse power engine at 5 per cent. ..	£35	0	0
Depreciation in value and wear and tear, 7 per cent.	49	0	0
	£84	0	0

Allowing engine to be under steam, four days a week = 208 days, which gives 8s. 1d. as daily cost for engine .. .. £	0	8	1
Ploughs, cost £70, at 5 per cent. on outlay, and 5 per cent. for wear and tear = £7 per annum, and for 100 working days, that would be 1s. 5d. per diem	0	1	5
Tank would cost £30, which at 10 per cent. = £3 per annum, would give for 100 days	0	0	7
Engine driver's wages at 24s. for 6 days	0	4	0
Boys, at 1s. per diem	0	1	0
Ploughman at 2s 6d. per diem	0	2	6
Coal at 4d. per cwt., 5 cwts.	0	1	8
Oil and waste	0	0	6
	£0	10	9

Autumn stubbles—in ten hours ploughing, we could do 7 acres easily equal to 2s. 9d. per acre; spring ploughing lea, 5 acres, equal to 3s. 10d.

Fiskens' system of Steam-tillage.

Having, together with Professor Macquorn Rankine, been appointed by the Society as a deputation to inspect the working of the "Fisken system" of steam tillage, we proceeded (April 10) to the farm of Offerton Hall, near Sunderland, in the occupation of Mr. R. M'Laren, where the "system" has been in operation during the past winter, 440 acres, we were informed, having been ploughed or cultivated on the farm since October last. Professor Macquorn Rankine was unfortunately unable to attend. The farm is of an undulating surface of about 500 acres in extent, and lying on the magnesian limestone. The fields appeared to have been deeply tilled, and the soils of varying textures were in a dry and friable condition. When wet, their tenacity would be greatly increased. There were no stones or other obstacles met with while the work was under our observation. Before giving the result of our inspection, it will be well briefly to describe the peculiarities of the "Fisken system" of working, as, although it has been before the public for several years, from various circumstances it has not hitherto taken a prominent position in the competitive trials of steam-tillage, which have from time to time been held. The "system" differs materially from the other "round-about" modes of applying steam power to tillage purposes. The engine which gives off the power may be placed in any convenient spot adjoining the land to be ploughed, on a roadway, or by a spring of water for instance, and the power given off is conveyed by means of light hemp rope (½ inch diameter) travelling at a high velocity —say 24 to 25 miles per hour—round the area to be operated upon, and communicating with two windlasses placed on opposite sides (headlands) of the land to be tilled. This high velocity, when communicated to the windlasses is, by a simple mechanical arrangement, reduced to any desired speed—say 2 to 3 miles per hour. This change of velocity being necessarily associated with the corresponding increase of tension of the ropes in the exact ratio of the rate of reduction of velocity (less, of course, the amount consumed by friction, &c). Thus an initial velocity of 30 miles an hour, when reduced at the windlass to 2 miles an hour, would correspond to an increase of tension (hauling power) equal to the rate of reduction—or 15 to 1. A strain or pull of 1 cwt. on the hemp travelling rope at the engine is therefore increased to a strain of 15 cwts. on the hauling rope (steel wire) working between the windlasses. In the transmission of power from the engine to the working implement, a loss will always take place, greater or less in proportion to the extensibility and elasticity of the travelling rope, and to the friction of the various moving parts of the engine and tackle. The implement—whether plough, cultivator, or harrow—is drawn by the steel wire rope backwards and forwards between the windlasses at any speed that may be desired. The mechanical arrangements of the windlasses enable the man in charge to haul them forward at the end of each "bout" and also to stop and start the implement at work the required distance with perfect precision, without communicating with the engine driver. Owing to some delay in reaching the farm, we found the work already commenced on a 14-acre field, of an irregular parallelogram shape, with a slight, but increasing gradient, along the time of working. The engine was placed near the entrance, and close to a watercourse, from which it pumped its own supply. The engine was one of Clayton and Shuttleworth's 12-horse power double cylinder traction engines, with 8·25-inch cylinders, and 12-inch stroke, and having a "grooved" fly-wheel 5 feet in diameter round, and by which the travelling rope was driven at the same speed as that of the periphery of the wheel, itself. The engine consumed about 1½ cwt. of coal, per hour, when at full work. The travelling rope was ½ inch in diameter, and made of the best Manilla hemp expressly for the work, in lengths of 250 yards, each length weighing about 112 lbs. Five lengths were required for the field. The rope, 1,250 yards in length, and weighing about 5 cwts., was carried round the field at a height of about 3 feet from the ground on light porters, with friction pulleys placed at distances apart of 50 yards on the light and 30 yards on the slack side of the windlass. The proper tension of the rope was regulated by a lightening pulley under the control of the engine-driver. While at work we timed the speed of the travelling rope and found it varying from 35 to 40 miles an hour. The "hauling" rope was of steel wire, ⅝th inch thick, and 800 yards long, equal to a straight draught (furrow) of nearly 400 yards long. The implement at work was one of Fowler's reversing cultivators, working 7 times, and covering a breadth of 6 feet, and set a depth of 8, increasing to 11 inches. The field had been steam-ploughed with a 10 by 8-furrow in autumn, and was now being cultivated for potatoes. The distance between the windlasses (headlands) was about 200 yards, and the average length of furrow was 190 yards. The double "bout," including the turning at both ends, took from four-and-a-half to five minutes, according to the depth of working, giving a working rate of about 2 acres per hour. The wire hauling rope, we noticed, was allowed a trial on the ground, Mr. M'Laren considering that the friction and extra wear and tear of rope was not equivalent to the cost of porters and attendants. The work was done in a perfectly satisfactory manner, no hitch or difficulty was experienced in any of the movements of the implement or of the machinery. The fly-wheel made from 180 to 200 revolutions per minute, and the pressure increased from 60 lbs. to 75 lbs. per square inch, as the depth of working was increased. Every part of the machinery appeared to be under perfect and immediate control. At our request, the cultivator was stopped several times while working 11 inches depth, and started immediately, without any apparent difficulty or strain on the machinery. The number of persons engaged was four—two windlass men, one plough man, and one engine man. From these data it is seen that (at 70 lbs. pressure) the engine was giving off a power equal to about twenty horses, while the cultivator was at his work. Not having any means (dynamometer or friction breaks) at our command to see how this power was consumed, that is to say, divided between the working of the engine itself, of the "travelling" and of the "hauling" rope, and of the windlasses, we could only obtain information from one Mr. M'Laren, who gave us the following as the result of his practical observations :—The engine, when working at the rate of 160 revolutions per minute, required a pressure of 8 lbs. per square inch to set its own parts in motion, and an increasing pressure of 12 lbs. per square inch, or 20 lbs. in all, to give motion to the full length (1,600 yards) of the "travelling" rope. This would be equivalent to a consumption of rather more than 2-horse power by the engine, and of 3-horse power by the rope, or a loss of at least 5-horse power before the strain or pull reaches the windlasses. These details require to be tested by direct and careful experiment, as also does the power consumed by working the windlasses, before any just estimate of the effective force or actual working efficiency of the tackle can be arrived at. Another important element for consideration, which has a direct money equivalent in the calculations, is the time required to set and adjust the tackle, to take it down again, and shift it to another locality. Mr. M'Laren informed us that they could begin to work in two-and-a-half hours after the engine and tackle reached the spot, and that they could take all up again in one and a quarter of an hour, or about four hours in all. Mr. M'Laren also informed us that he had ploughed a field of 33 acres without having to shift the tackle at all, and another of 55 acres without having to move the engine which was placed advantageously close to a supply of water. We were also informed that the engine and the whole of the tackle had remained out in the fields during the whole of the winter, and certainly without any apparent deterioration to rope or machinery. The main advantages claimed for the "system," simplicity and economy of working arrangements of first outlay, and general adaptability to fields of varying size and shape appear to be substantially borne out by the practical success it has achieved on Mr. M'Laren's farm. Until, however,

It has been ascertained by direct and careful testing what amount of power is consumed by friction, &c., and what amount of force is consumed by the arrangement of the tackle, it is not possible to give any judgment as to the practical efficiency of the "system," or its comparative economical application. If the results on these points be satisfactory, we shall no doubt soon see another and a powerful competitor for public favour in the field of steam-tillage, and Mr. Finkou will be entitled to the thanks of the agricultural community for having successfully worked out a new mode of applying steam-power to the mechanical forces of the farm.

P. B. Swinton, Holyn Bank.
John Wilson, Edinburgh.

Edinburgh, April 28, 1871.

Note.—Although we had said that the rate of working of the apparatus, when under our observation, was about 2 acres per hour, it is right to mention that, having left the field for about an hour, on our return we found that the amount of work done in our absence was only equal to 1½ acres per hour. From whatever cause this arose, there did not appear to be any want of steam-power, as when the engine was stopped, steam immediately blew off from the safety-valve.

P. B. Swinton.

AGRICULTURAL STOCK:

THE BULLOCK-FOLD,

BY J. J. MECHI.

There are several reasons why farmers prefer sheep to bullocks as the more profitable animal; when folded, all their manure is at once supplied to the soil; 13-14ths of it is urine, (by far more valuable than the soil), and it sinks at once into the soil, where its most useful portions are arrested and retained for the food of plants. There is, in fact, no waste and no expense in thus applying the manure, but with bullocks, in the ordinary farm-yard, there is waste of manure by rain or the drippings from untroughed buildings; then there is carting to a dung-heap, unloading, turning it over, refilling, and recarting, and a further waste by exposure and washing.

There is also a great waste of valuable straw, which might more profitably be used as food. All these evils and losses are caused by open farm-yards, the abolition of which I am endeavouring most strenuously to enforce. I know the difficulty of overcoming old attachments. I was going to say prejudices, but I cannot believe that my brother agriculturists will, in this enlightened age, sacrifice their pockets at the shrine of their prejudice. I am, therefore, about to prove in this paper that the bullock-fold, or covered yard, is almost as uncostly and beneficial to the farmer as the sheep-fold, and that it has very great advantages over the turning-out and roaming-at-large system; in fact that, as regards the health and progress of the animals, the quality of the manure and the cost of its application, the bullock-fold or covered and enclosed yard has an immense advantage over the ordinary open farm-yards with sheds.

I don't expect everybody to believe this. I remember the time when everybody did not believe in gas, steam, railways, or telegraphy, so I shall not be surprised or displeased at such a disbelief.

The health and progress of the animal, and the quality of the manure in enclosed and covered yards, depend upon certain arrangements, which I will detail; and it must be remembered that I am speaking with the authority of a practical experience of twenty-five years. At a recent agricultural meeting, when I recommended covered and enclosed yards, there was a general exclamation that animals there would be unhealthy, and so they would under the following conditions:—

One of the greatest curses of agriculture is want of ventilation, and it is this which causes farmers to believe in and prefer open air. The poisonous exhalations from our skins and from our lungs, as well as those from animals, must prove injurious to health, unless permitted to escape and to be replaced by pure air. Every public man and many private persons must know by their feelings, and shew it by their gaping that confinement in an unventilated room (shut up in a close box, in fact) is discomforting, distressing, and unhealthy. Fortunately for Britons, the open fireplace and lofty chimney cause a draught, and open a mitigation of evil consequences; but there are no chimneys in our bullock stalls and stables. Ninty-nine out of a hundred of even our new farm-sheds and stables have no openings in the roof, consequently farmers, from costly experience, prefer open yards and sheds for their horses, because they know that their animals would be unhealthy in these closed boxes or apartments. Louvre boards in the roof are of little use, for the air flows in at one side and out at the other, without entering the interior of the enclosure. Again, one large circular or square opening in the roof will not permit the hot air to escape; but divide the opening into two or two circular openings, and you at once get a circulation—the foul and foul air going up one opening, and cold fresh air coming down the other.

In the case of the louvre board, I use a dependent board, about one yard deep, and I can see by the steam that the fresh air entering at one side of the louvre boards drives the air or steam forwards, and forces it up and out at the other side, thus causing constant change and circulation of air.

I have also openings of about 9 inches by 3 under the wall plate, and above the animals, which increases circulation in hot weather. Candles go out where there is no circulation of air for want of fresh oxygen, and we are only living candles or fires on a larger scale. I, some time since, quoted an interesting instance of the evil effects of want of circulation of air. A well-known Yorkshire agriculturist had a long enclosed shed for his calves, and very successful he was as regards their health. The shed had a door at each end, and somehow or other one of these doors would be frequently left open, so after some years, one doorway was built up and closed. Once so lucky with his calves, now a change took place, and many losses happened. No one could account for this unfavourable change, but at last it was thought that the building up of the door might have had some influence, so that was re-opened and the calves again prospered. In my place of business, in Regent street, where we burn fifty gas lights, the heat and effluvia were annoying and injurious to our goods and health, until we adopted Watson's ventilators, which at once put us all right. They consist simply of a tube divided vertically, with a dome to keep out rain; we know in a few moments, by our feelings, whether they are open or closed.

The diseases in our pigs are often caused by want of circulating air; they huddle together and poison the atmosphere, especially on soft barley straw, which permits no air to pass under them. On boarded floors with openings, or sparred floors, no evil results can occur, because the air circulates beneath and among them, and the impure air is carried away. When I had 360 pigs closely packed on sparred floors with a deep space under them, I never had disease among them, although many farmers thought there would be. Shut up horses in a close stable, and some of them will get farcy or other complaints. A putrescent, unchanged air, must prove injurious to both man and beast. One fertile source of lung-complaint, fever, and disease in cattle, is variation of temperature. Woolly animals are less subject to it than hairy ones, and one of the great advantages of the enclosed and covered yard-system is equable temperature.

I remember dividing a lot of cattle, putting six of them in a barn, the rest in the enclosed shed with sparred floors. The barn door was opened once a month for threshing, the animals got cold and lung-complaint, the others in the shed were perfectly healthy.

As autumn approaches with its wet days, cold nights, easterly winds, and hoar frosts, there also comes ill-health among our cattle. This is not the case in well-ventilated, enclosed, and covered sheds. At this season of the year, while animals are putting on their winter great-coats, they should be most carefully housed. The losses by turning out horses, as well as cattle, is very considerable and alarming in its total. In the shed, with sparred floors, I have not lost an animal for twenty odd years, and scarcely any in the others. During the cattle plague, with seventy cattle, young and old, we escaped the disease, although our neighbours suffered.

But while commending bullock-houses, a word of warning is necessary. If you litter heavily, as in the open farm-yard, you will have fermentation and disease. Straw should be used very sparingly just enough to keep the animal clean. He will tread it down into a wet paste, and thus exclude air which otherwise would, with loose heavy littering, produce fermentation, fire-fanging, and disease. We seldom remove the manure until it is 18 inches deep, short, and fit to go at once on the land. I prefer a shed that will hold a score of bullocks. Short-horns soon agree together. In single boxes they cannot tread the litter close to the sides.

Drafted ewes fatten quickly in houses, the food prepared and brought to them. At Tiptree it would be a vain attempt to fatten them in the open field on the roaming-at-large principle. This is contrary to the general impression, but there is no mistake as to the fact, and as to what is the more profitable mode. In feeding stock, we should study nature. A good pasture contains a great variety of grasses, varying in composition at time of ripening, &c. Let us take the hint and supply a variety to our shedded animals. Mr. Horsefall's admirable practical and chemical practice in the matter of stock-feeding is recorded fully in Vols. XVII. and XVIII. of the Royal Agricultural Society's Journal, and deserves, and will repay, a careful study. For growing animals, variety of food adapted to their wants is indispensably necessary, for their frame must be built up with all the requisite materials, or they will never be perfect and profitable animals.

My animals, whether in the field or in the house, are fed on cake, hay-chaff, straw-chaff, corn (ground), malt coats, bean, roots pulped, or green food cut into chaff, a little condiment, and rock-salt to lick. In these we have matter for the formation of bone and muscle, and other portions of the body.

Our ideas in regard to stock are still very pastoral. When I

say that I have only one-twelfth of my land in permanent pasture, I am asked, "then, how can you feed your stock?" I reply, "with beans, oats, clover, tares, mangold, turnips, and khol rabi, supplemented with the straw of all the crops cut into chaff, and aided by cake."

It is worthy of notice and remembrance that the Prize Oxford Farm of 800 acres had only 80 acres of poor, ill-conditioned pasture, and that the praise and prize were given for the well-managed and productive arable land. The live stock question is a vital one for agriculture. The hundred and odd candidates for our Agricultural Benevolent Institution almost invariably preface the causes of their misfortune by "losses on live stock." Nor can I wonder at this when I see and know how inefficient and improper is, too often, its management. A sudden change of wind to the north or east, hoar frost on the food, and other causes of disease and death, to which exposed animals are liable, inflict immense loss on agriculturists, and should warn our land-owners to provide the means for preventing such casualties, and farmers should learn to believe in the use of them.

I have named the bullock-fold because it is the same in effect as though the bullocks were folded on the land. Nothing is wasted, for all the manure, solid and liquid, is supplied to the soil, and at the smallest cost. No artificial manure can compare in cost or effect with this.

It appears to many remarkable that there should be scarcely any smell from the manure. If there was, it would be a sign of improper and excessive littering. The manure is so trodden and compressed that air is excluded, and heat, fermentation, and smell prevented. When, however, the manure is broken up by forking it into carts, its smell and power are unmistakeable.

INDIAN AGRICULTURE.

LORD NAPIER ON NEILGHERRY FARMING.

The following Minute by His Excellency the Governor, dated Ootacamund, September 22, No. 134, is published:—

The Government possess, in the Superintendent of the Experimental and Model Farms at Sydapet, an experienced and discriminating Agriculutrist, whose services they are about to employ on a large scale in the improvement of husbandry throughout the country. The scheme for the institution of provincial farms, which the Government have sanctioned, has reference to cultivation in the plains, and with reason, for the plains have the first claim on our attention. The hill ranges of the Presidency do, however, also offer a legitimate subject of inquiry in this respect, and the Neilgherries, as the seat of the Government Sanitarium, of an increasing planting interest, of an independent English population, of large establishments for the support and education of English and East Indian youths, and of a Native population, embodying a cultivating and a pastoral tribe, would justify a special investigation. With this view I would direct Mr. Robertson to proceed to Ootacamund, when he can best be spared from his employments at the Presidency, for the purpose of reporting to Government on the productive capacities of the district, and I would direct his attention to the following points in particular, but not limiting him to these:—

To the capabilities of the hills for the purposes of breeding horses, horned cattle, and sheep.

To the facilities which these hills may afford for the institution of small farms on the European system, worked in part, at least, by European labour.

To the improvement of the husbandry of the hill-people.

It may be doubted whether the Neilgherry Hills would ever be well-adapted for breeding horses cheaply of a superior quality, such as are demanded for the Army. Horses would not be able to run out with safety in all parts of the plateau during the whole year; they would require protection at night, artificial fodder, and skilled superintendence. Good stock might, no doubt, be bred by private parties as a matter of taste, but it may be doubted whether Government would find such an undertaking profitable. Nevertheless, the question of horse-breeding on the hills is one which may deserve to be examined by a person more competent to decide it than I pretend to be.

The horned cattle of the hills are either a degenerate sort of Native cattle, or a cross between the European and the Native breeds. The latter does well, but I question whether the proper European races have been selected. The European blood has generally been imported from Australia, and I suspect that the English short-horn is usually the parent of the Australian stock. No one would, however, in Great Britain turn out the short-horn stock at a high elevation in a moist climate. It has always appeared to me that the West Highland breed might prove to be well-adapted to these hills, either as a pure stock or crossed with the country cattle. They would ascend the highest steeps, stand very stormy weather, consume a rough description of herbage when there is grass on the ground, and be satisfied with a coarse sort of hay, under the simplest cover during the great heats, and the heavy stress of the monsoon. Mr. Robertson would, however, on a careful inspection of the grasses of the country and of the existing sorts of cattle, Native or crossed, and on due consideration of the temperature and rainfall, be able to decide [illegible] improvement in the breed of cattle on these hills by [illegible] in selection or importation. The report by [illegible] markets of Coonoor and Ootacamund [illegible] beef, which is at present supplied, in a great measure, from the plains, though the pastures of the plateau would appear to be capable of supporting more numerous herds than are driven over them at the present moment.

A far greater boon to these hills, than a good breed of cattle, would be an appropriate breed of sheep, for, in addition to the meat supply, there would be wool for which a ready sale would be obtained in the country. The Native sheep of the adjacent plains in the Coimbatore District would be too delicate to run out on these mountains all the year round, and the crosses which have been, up to the present time, effected with European breeds have not, in my opinion, been judicious. There is little use in attempting to raise a mountain-breed of sheep by crossing the Native stock with the Leicester, in Southdown, or the Merino [illegible] far less by turning out these breeds in the pure state under an uncongenial sky and on pastures altogether repugnant to their habits. What is wanted here is a breed of sheep inured to high elevations, steep ground, rough weather, a heavy rainfall, wet soil, and coarse grasses. The habits and qualities appropriate to the Neilgherries would be found in the Cheviot and black-faced breeds used on the borders of England and Scotland, which are hardy, and which yield good mutton and a heavy clip of useful wool. That sheep should be profitable here. It is indispensable that they should be able to run out the whole year in all weathers; that they should never require artificial shelter or artificial food, though it would be necessary to fold them at night for protection against the attacks of wild beasts. If any sheep would stand such hardships, it would be the black-faced Scotch sheep. I do not affirm that they could do so, but it might possibly be worth trying, and no one would be more capable of giving an opinion on the expediency of making the experiment than Mr. Robertson, after local inspection and consultation with the Commissioner and with experienced residents on the hills.

Some discussion has occurred from time to time respecting the possibility of appropriating portions of the Neilgherry Hills for the purpose of establishing European agricultural settlers; for the purpose, in fact, of creating a self-supporting English rural population. On a first view of the plateau, such an undertaking might seem promising to an inexperienced eye. The climate is fine for a large portion of the year, the temperature is congenial to the European constitution, the soil is rich, there are apparently large tracts of unappropriated ground, there is a market; there are conditions favourable to the production of cereal crops, garden-crops, fruits, and valuable commodities for exportation, such as tea and coffee; there is a friendly and fostering authority. A close inspection and analysis, however, tend materially to qualify such favourable expectations. Much of the good land on the warm side of the hills is subject to the rights of Native cultivators; the cost of building is excessive; the price of labour is high; clothing is dear; medical attendance and education would be costly and difficult of access; the sale of grain-crops, fruits, and vegetables would offer little money-remuneration compared to the wants even of a humble European family; the returns of tea and coffee-culture are slow and liable to great fluctuations. A poor man would find it difficult to establish and maintain himself, a richer man would prefer to go elsewhere. My own impressions are decidedly unfavourable to the hills as a scene of agricultural settlement for Englishmen; but I think that it would tend to the correction of erroneous impressions and to the formation of sound opinions that this question should be illustrated by the report of a person of unquestionable judgment and practical knowledge in such matters. The formation even of a limited-working and self-supporting English community on these hills, if it could be effected under favourable conditions, would not be without importance, either in a commercial or political point of view; and the basis for such a community might be found, in part, in the Male and Female Military Orphan Asylums, which are about to be permanently established on the Neilgherries. There is the land, and there are the people; the question is whether they could be made to suit each other.

The cultivation now practised by the Thadagas displays a considerable variety of small cereals adapted to the climate and the soil, an increasing application of manure, and more [illegible] than is usual in the plains. It may be doubted whether a greater weight of grain or a [illegible] of human sustenance would be raised by the substitution of European seeds or crops on a given area than that which is now obtained. The poverty of the cattle herds, however, [illegible] of root crops, artificial grasses, and green crops. The same defect is apparent from the deficiency of hay in the market of Ootacamund. The system of grain-cultivation is associated with long fallows. The principle of rotation or substitution of crops is [illegible] practised. Without entertaining any very [illegible] of a rapid improvement of Native [illegible] impulse on the hills, it can scarcely be doubted that [illegible]

ing various agencies, useful innovations might be gradually promoted, and the suggestions of Mr. Robertson would not be without value to the Commissioner.

Should the Government see fit to adopt the step here proposed, and entrust an investigation of the agricultural condition and prospects of the Neilgherries by the Superintendent of Government Farms, we should then be able to judge whether a Government undertaking, either for breeding stock or for the improvement of cultivation, by example, would be justifiable. Any attempts in these directions, which we might make, would never be of broad utility to the general population of the country, who are placed in circumstances radically different; but we have a duty to our own countrymen, who have been cast, by necessity or choice on this portion of English territory, and we possess in the Lawrence Asylum, in its labour, power, and in the land attached to it, the elements and means of experimental culture.

ESTABLISHMENT OF MODEL FARMS IN DISTRICTS IN INDIA.

Demi-official from A. O. Hume, Esq., C.B., Secretary to the Government of India, Department of Agriculture, Revenue, and Commerce: to Local Governments and Administrations, dated Simla, the 2nd November 1871.

I AM directed to forward, demi-officially, for consideration and for private distribution to all revenue and other officers who are interested in such matters, copies of a brief note drawn up by the Secretary to Government in this Department on the subject of agricultural reform.

2. It must be distinctly understood that the Government of India at present neither accepts nor negatives the proposals and conclusions embodied in this note. The object in circulating it is to obtain, demi-officially, the freest possible expression of opinion from all officials interested in such subjects, both as to the means which this note suggests, and as to any other means which their experience may lead them to recommend, for improving and developing the agriculture of the empire.

3. This note probably possesses little claim to originality, and is unquestionably very imperfect; but it may yet serve as a nucleus round which much valuable information and many useful suggestions may readily crystallize.

AGRICULTURAL REFORM.

Although it would occupy some considerable time and space were I to attempt to elaborate the details of the scheme I advocate, a very few words will suffice to convey some idea of the project.

I must premise that my first contention, derived from my personal experience, is that large farms intelligently managed will, even in this country, after the first two or three years, cover all their expenses and give fair interest on any capital employed. Further, that this will be the case where land has to be rented from private proprietors, and that *a fortiori* this will be the case where the land belongs to Government and is either unassessed or only liable to the moderate jumma that Government imposes.

The farms must be of considerable size,—not less certainly than 1,000 acres,—or they will not pay from their profits the cost of supervision which, if the scheme is to possess any real vitality, must be of a high order.

Briefly, what I contemplate is at least one large Government Model Farm in every district of the country, where all existing staples shall be grown, at first in the most approved local native fashion, and year by year on improved and ever-improving systems, and from seeds year by year improved by selection, and, where necessary, by interchange with other similar farms, where cattle, sheep, and poultry-breeding shall be cautiously, but perseveringly, carried on, and where locally unknown staples and breeds should be gradually introduced, acclimatized, and popularized. The whole of these farms should be closely connected with each other. Their supervisors encouraged not only to vie with each other in results, but to visit and communicate with each other in the freest manner possible. Liberal prizes should be offered for those supervisors who make their farms pay best, and, besides these, provincial exhibitions should be held with numerous prizes for excellence of produce, whether agricultural or animal, equally open to the farms and to the agricultural population generally. A special Agricultural Journal should be started for the record of all done at these farms, all experiments, all failures, all successes, so that all might know what all were doing, and so profit mutually by each other's experience.

With due care in the selection of the men to begin with, it would be impossible under such a system but what some man possessed in an eminent degree of all the capacities requisite for the development of agriculture, should be evolved, and real and important progress effected.

Directly it became, on the whole, an acknowledged fact amongst the people of any district (and the people here eyes as well as we have, and can appreciate good crops and better methods of tillage just as well as we can when they see them) that their model farm was really growing better crops, or growing crops similar to their own, cheaper, or breeding better stock, or turning out better seed than they were themselves able to do, sons of well-to-do cultivators, peasant-proprietors, and the like, who concern themselves personally with practical agriculture, should be allowed and invited to reside at the farm, and familiarize themselves with the system there followed, and the methods of caring for the stock there bred. All that showed capacity and intelligence and deserved it should be furnished, at cost price, with improved seed or stock to start with on their own lands.

Such farms should, in fact, become at once a practical school of agriculture and a source of supply of improved "materiel," whether vegetable or animal.

This is not an Utopian idea, it is susceptible of being carried into practice, if we only act boldly and judiciously, and on a sufficiently large scale. Nor is it sufficient to assert that it will repay indirectly manyfold the expenditure incurred; my contention is that in the long run it will directly and fully repay its own expenses.

The great difficulty, it will be said, will consist in obtaining supervisors, and at first starting this is unquestionably the rock upon which the adventure would be most in danger of shipwreck.

But it must not be supposed that I contemplate starting all these farms at once. I would select a single division of, say six districts, and in this start six farms. To each supervisor I would give two, three or four apprentices, intelligent youths, Country-born, English, Eurasian, Native, some of whom would, probably, become in time qualified to take charge of farms in other districts, under the supervision of their trainers, who, as time went on, could manage, especially near lines of railway, two or even three farms each. I would also, from time to time, bring out young men of a higher class, who after a year or so training, acquisition of the native languages, &c., would be competent to assume independent charge of farms, and undertake the training of apprentices, &c. Thus the scheme would grow and spread until the whole province was covered. Doubtless, once it was fairly started in one province and established as a success in a single division of that province, other provinces would desire to make a similar commencement. Some fresh men would have to be got out from Europe, some would be spared from the first province in which the scheme was started, so that in ten or twelve years we might hope to have covered the whole Empire.

But still the selection of the first men will be a most difficult matter. We require not merely a certain amount of scientific agricultural training, not merely a certain amount of practical knowledge as farmer and stock-breeder, but a strong healthy physical frame, energy, and industry, and a mind so far generally cultivated that it shall be capable of adapting itself to new combinations of circumstances, of applying its experiences to these, and thinking out for itself the new problems that will inevitably arise.

Some such men are to be met with and might be enlisted in our service if we paid them fairly to begin with, made them clearly understand that their promotion or increase of salary depended on their success, and held out to them the certainty of a considerable share in any net profits realized when once their farm had cleared itself of debt.

It must be borne in mind that I base my hopes of success on the large scale of my proposed operations. Many of our men would, doubtless, turn out average good creatures incapable of *originating* any important step of progress; but with a number, carefully selected to begin with, with emulation-prizes to gain, free inter-communication of experiences and ideas, and prospects of solid rewards, it would be impossible that here and there some man suited exactly to the needs of the country should not be developed, and one such man in a province, or in the Empire even, would leaven the whole.

I do not expect to get such a man at once, but even after the two first years, we should very nearly pay our expenses, and by that time some one or other of the men, though not, perhaps, what we hope for ultimately, would be qualified to lead and guide, and year by year, with careful administration the average results would improve.

Now about these men. The first thing I should set them down to do, would be to learn the language and the agriculture practised in the district in which they were to start their several farms, not to live fine gentleman-like in stations, but out in some agricultural village amongst the people. They must, of course, be men young enough to rough it, unmarried, with the even tempers that so often accompany a well-organized physical frame, and with a fairly-cultivated mind. I would not let them start a farm of their own until they had thoroughly familiarized themselves with existing agriculture, and I would make them start their farms in general harmony with that system, with only such minor modifications (*e. g.*, improved supply of manure, &c.) as are patently desirable to everyone who has ever engaged practically in the work; and as I said before, each successive year should witness some cautiously-introduced improvement. As to the lands to be furnished for these farms, as a rule, I would not hire them. There are in many districts villages, the property of the State, which for years past we have been almost recklessly selling by auction: here and there we might find some of these situated to our purposes, and in no way, perhaps, could our men begin better their apprenticeships than as resident managers of such properties, which they might begin to take into farm after the first year. In other places, waste lands might be taken advantage of, and settlers brought thither to work on these by a system of inland emigration, which might help to secure, for the service of the Empire, the wealth that, in the form of working men, we are yearly lavishing on other colonies and foreign nations.

It will be said that after all the scheme promises but slow progress. That we are to wait a year for this, another for that, and this is perfectly true; a measure like this must be slow to be sure. We have the *inertia* of past cycles to overcome, but once we turn the corner, one single farm (possessing no exceptional local advantages) begins to pay in earnest, the progress will be as rapid as any reasonable man who knows the people and the country could expect or hope for. And now about funds. My idea is, that this scheme needs, for its success, the co-operation of both the Imperial and Local Governments. On the gross expenses, a certain portion, say one-half, should be advanced as *taccavee* by the State, to be recovered as a first charge from sale-price of crops, &c. The other half should be contributed by local funds. The *taccavee* repaid, all profits (except such share as might be allotted to the supervisor) should belong to the Local Governments. Perhaps we might even go further and engage, on behalf of the State, to pay the salaries of the men we get out until they got regularly into work, say for a period of two years each. There are even now, I believe, Local Administrations which accept these terms, and doubtless hereafter there will be many more. This is, indeed

I feel a sketchy outline of the scheme that I should advocate, but it will, I hope, suffice to give His Excellency some conception of my ideas.

TOBACCO.

Letter from the Government Quinologist to the Acting Sub-Secretary to the Board of Revenue, dated Ootacamund, 28th July 1871.

In accordance with the wish expressed in Board's Proceedings No. 2670, of July 3rd 1871, I have the honour to submit certain analyses of tobacco which I have received from the Board of Revenue or from certain Collectors. I beg to quote these in continuation of those contained in my report appearing in Proceedings of Revenue Board, No. 2778 of 7th July 1871. These analyses, I believe, complete an examination of the tobaccos of the Madras Presidency. An explanation of the meaning of the numbers will be found in report above referred to :—

Numbers.	Tobaccos received from	Percentage of Ash.	Percentage of Potash.	Percentage of Nicotine.
54	Kistna, Chebrole	19·03	15·36	3·53
55	" Oodoomoodi (Lanka) ...	18·6	11·10	2·04
56	" Umidapilly (") ...	17·85	15·38	1·38
57	" Tattapoodi (") ..	19·53	8·72	2·22
58	" Alamur (") .	20·30	10·66	2·63
59	" Kadar (") ..	17·07	11·36	4·27
60	" Ankampalloo (") . ..	16·63	12·14	2·56
61	" Purshotmill (") .	20·08	13·73	2·84
62	" Narakamill (") ..	19·13	10·01	3·55
63	" Kotoonga (") .	19·18	17·69	3·84
64	Coimbatore Madhally	23·45	5·33	2·32
65	" Satiamungalum (A.) .	17·00	14·74	2·88
66	" " (B.) .	21·34	8·87	3·74
67	" " (C.)	25·14	9·14	3·02
68	South Canara	17·30	5·6	4·98
69	South Arcot, (not labelled)	21·61	13·32	4·26
70	" Manaloor Patay . . .	4·84	8·63	1·86
71	North Arcot, Arcot	24·48	5·32	1·56
72	" Arnee	22·08	2·05	3·55
73	" Wandiwash	24·32	2·74	3·13
74	" Vellore	19·78	2·75	3·13

The tobaccos from the Kistna District grown on the Godavery are by far the highest in quality of any Indian tobacco that I have examined. Nos. 55, 57, 58, 60, and 61, are specimens of tobacco of real excellence. Nos. 57 and 58, though different in flavour, would be, I think, considered of equal quality with Manilla tobacco. It will be observed that tobacco from this district differs from that grown in most parts of South India, in containing a large proportion of potash in its ash. I have no doubt whatever that if seed of the better foreign kinds were sown in the soil that produced the specimens I have analysed, tobacco would be grown quite equal to the foreign kinds. Nos. 54, 56, 59, 62, and 63, are by no means of bad quality; but the latter differ somewhat in degree from that of the tobaccos that are most favoured in Europe. The general deficiency of organic salts of potash is undoubtedly the main defect of the tobaccos of this Presidency, and the remedy of this deficiency, by suitable cultivation and application of potassic manures, will be the first step towards the improvement of tobacco cultivation.

The specimens of tobacco received from Satiamungalum, close to the foot of the Nilgiris, are of good quality, and are the best I have received from Coimbatore. Satiamungalum is a place where the seeds of foreign tobaccos would have a great chance of success if cultivated like the native kinds, and if the native dislike to novelties in cultivation gives them fair play.

The only other kind of moderately good quality I have met with is that from Manaloor Patay in South Arcot. The employment of jaggery water in the curing of tobacco, though doubtless rendering the leaves more easy of manipulation, is detrimental to the quality of the tobacco, according to the European standard.

The greater number of the specimens of tobacco that I have received testify to the general want of care and attention in their drying and curing in comparison with the good foreign tobaccos. Full attention to the details of these processes will, however, be quite necessary to the production of good tobacco, more especially if it be employed in the manufacture of cigars.

Submitted to Government, in continuation of Board's Proceedings No. 2778, dated 7th July 1871, embodied in Government Order No. 1318, dated 27th idem.

The Board imagine that the specimens so favourably spoken of by Mr. Broughton, in paragraph 3, must have been received from the Collector of *Godavery* (who promised to send samples in his letter No. 397, dated 7th December 1870, recorded in Board's Proceedings No. 132, dated 11th January 1871). Mr. Broughton is requested to make inquiries on this point. The Board believe that tobacco is not much grown on the islands of the Kistna.

THE COCOANUT TREE AND ITS CULTIVATION.

The Cocoanut Palm is one of the most useful trees to man, since it is applicable to such various uses, and is productive for so long a series of years: still the means to be adopted for its propagation and further cultivation are so little understood, that foreigners take but little lively interest in it; nor do the natives, who are those principally benefited, care much to improve, or fully enjoy those blessings in their reach. Hence the advice and opinions of more than a thousand ryots of Travancore having been consulted, their experience has been made use of to draw up the following instructions, with a view to supply a deficiency, and draw the attention of any desirous of entering upon so important a source of profit:

The nuts for sprouting should be chosen from those fully ripe, having full large eyes and such as have been gathered from trees past the middle age—not however from aged ones—and from clusters containing few fruits. These, if carefully planted, are said to ensure the timely sprouting and steady growth of the plant as well as future luxuriance, longevity, and uninterrupting fruitfulness. Such nuts as are gathered from February to May are generally the richest in oleagenous properties, and hence should be preferred. Nuts taken from older trees have the eyes small, and the sprout will in consequence be thin, weak, and disproportionately long; and the future tree if able to bear fruit, will be irregular and deficient in produce. Those nuts which may be taken from trees of immature age will, if planted, rot away at the eye. And the plants, if any be successfully reared, on transplanting, will grow very rapidly and acquire bulk—but the fruit will drop before the kernel acquires consistency, the foot stalks break, and the trees entirely fail before mid age.

The nuts for seed should not, on being gathered, be allowed to fall to the earth, but be lowered in a basket or fastened to a rope. If let fall the polished cover to the fibres will be injured and collect damp about the nut, or the shell inside may be cracked and the water disturbed. These are fatal injuries, or even if the plants still grow, they will on being transplanted not make fresh shoots, may produce weak trees having their fronds constantly drying up, nuts rarely matured, and often are even without kernel in those which appear perfect. If the nuts are allowed to dry on the tree before gathering, the plants are liable to be lost, not having water inside to cherish the growth of the sprout (before the actual roots shoot into the soil).

The seed nuts, after being gathered, should be carefully kept for not less than a month before they are planted (in order that some of the moisture be absorbed, and the hard outer skin or rhind be rendered dry and water proof). If the seed be immediately planted, the outer pod with the containing fibres will rot, and there will be no sprout. The eye will rot or be a long time sending out the shoot, which will inevitably produce a weak, profitless plant. On the other hand, should a longer time intervene between gathering and planting seed, than prescribed, the capsule of the fruit will fall off, and consequently the exposure to damp and rain will affect the eyes, there will then be no plants, or very indifferent ones.

The seeds should be planted on an elevated plot or bed of land where water will not stagnate. The plants will be strong if the nuts are placed on the hard sandy court-yard of the farmers' dwelling house; or if placed in flower pots with good soil and sand in them, no damage will be done by white ants, and very few will fail to germinate. If, however, they are placed on a hard soil which roots cannot penetrate, and they are exposed to the sun, the water inside will dry up, damage will be done by ants, and those few that throw out shoots, will be weak, and on transplanting, the roots will break and the sprouts will be severed from the nuts. If, on the other hand, they are deposited on uneven ground or too moist soils, both the fibrous covering and the eyes will rot, and the seeds come to grief.

Nurseries should be somewhat exposed to the influence of the sun, though not too much heat—plants thus grown will even, though deficient in stature, be strong, and when transplanted will not fail nor suffer from heat. Should plants however have but little sun, no great harm is done; but if they be grown entirely under cover, insects will infest them, the stems will be long, tapering, and weak, the fronds will be often unable to sustain their own weight, and when transplanted, each successive hot season will affect the trees.

The planting of the seeds should take place from January to April, and also in August, provided the rains are moderate, and then the planter may expect fruitful trees to be produced when grown, but nurseries formed during the heavy monsoon will generally fail, or produce trees which will yield small nuts. (Too much moisture of every kind is injurious to plants.)

The seed beds, where the plants are to be nursed, should be well dug to from two feet deep, and all stones, roots of trees &c., removed; the cocoanuts should then be laid along flat on their sides, in such a way, that all but two inches of each nut is in the soil, the intervals between the nuts being about a foot in width. Should the space be too great, the plants will have too many roots, and sun will not be shaded from them by the fronds which will be shown by the pale green of the leaf. But should the nuts be placed too close to each other, the young shoots will be thin meagre and quickly spindle up; the roots too will twist together and be broken when the plants are taken up to be transplanted.

Manure is of little use to the seeds before taken root, yet in order to prevent white ants, &c., a mixture of salt and ashes, or ashes alone, should be put into the trenches made in the beds for receiving the cocoanutseed. Sand alone, or salt with ashes, sand and paddy husk, form another mixture to be placed between the earth of the bed and the seeds, which latter should be covered with the compost. Black salt, ashes made from the cocoanut husk, and fronds with sea sand, is the best mixture. If this precaution be not used, many of the seeds will be injured and the plants grow pale and weak.

Some, however, are of opinion that these composts should not be used in the nursery, as they tend to force the plant which, when transplanted, will then decline, but that the application is best *after transplanting*; and that in the nursery beds, black salt dissolved in water is sufficient to keep off white ants; early manuring, in their opinion, lessening its after effects.

The next care is *to water* the nursery, which should be done only every second or fourth day, according to the dryness of the weather, simply keeping the soil moist; for if the ground is too damp, rot is engendered, but if too dry the cocoanut water inside the nuts will evaporate and the shoots dry up.

A careful observance of these instructions will cause the cocoa-*seed to sprout* generally within six months from the time they are placed in the ground.

Some place those cocoanuts intended for seed tied together in pairs by a strip of the covering on the cajan over the roof tree of the dwelling house, or on branches of jack-trees, freely exposing them to sun, dew, and rain. But when the shoots are a few inches long, they are taken down and placed in a nursery till transplanted. Such plants are seldom lost and make no great delay in yielding fruit.

Once the tender shoots begin to appear, no great care is necessary for manuring, but the greatest attention should be given that no cattle or insect, &c., injure the shoot itself, else the slightest blow or abrasion will cause a want of vigor; but on the other hand, some suppose that unless either ashes alone, or mixed with salt and sands, or these separately be applied to the plants *every month*, a want of colour will be visible in the opening leaves, or ants and other destructive insects will be fostered. Plants are removed for *transplanting* generally in the second or third year, sometimes even in the ninth month, but rarely so late as the fifth year, but in ordinary cases if they be transplanted six months after the shoot makes its first appearance, their safe growth and vigor may be looked for. In low-lying lands, however, it is preferable to have plants *of one years* growth, though they are more difficult in managing. The only benefit to be expected in transplanting older plants is that the planter looks for an earlier return, and in planting these on the banks of rivers or low lands formed from the wash of the monsoons, the crops will not be deficient. Plants left too long in the nursery and then removed are apt to have the fibrous supports at the foot of the fronds decay, so that these hang down, wither, and dry up, and new fronds and leaves do not make their appearance for four or more months, and these generally die prematurely. Some of the planters give it as their opinion that the transplanting may be effected from January to May and again in August, October, and November, (*i. e.*, omitting the wet months). Perhaps, however, the *general* rule should be that in low damp situations, planting may be effected during the hot season, in salt marshes and on hill sides during the monsoon. It is said that those trees planted from January to June will yield fruit for eight months in the year, and those planted in October for *six* months, while those planted in June and July in the heavy rains will scarcely be fruitful at all. The majority of reports, however, state the months of Madura and Chingam to be unsuitable for planting, and that different places and soils require different seasons for this operation, to be learned only from experience or observation of neighbouring gardens. Soils suitable for a cocoanut plantation are variously described as below, particularly pointing out that stony grounds, or those overlying rocky foundations, are to be avoided:—

1 Soils mixed with sand, either dark coloured or river-washed.
2 Where sand is mixed with clay, ferruginous earth, or black mould.
3 Clayey soils where the under strata consists of sand.
4 Sand and clay, even when mixed with gravel and pebbles.
5 The sea shore banks of backwaters, rivers, tanks, and paddy-fields.
6 All sides of rivers and backwaters, provided one and half cubic of land is to be generally seen above water level.
7 Marshy land even in brackish soils (but not where salt is formed in crystals by evaporation).
8 All level lands exposed to the sea breeze where the soil is spongy the valleys between hills, banks, and ditches, which have been filled up.
9 Lastly, even the floors of ruined houses well-worked up, and may plenty manured by cattle and human beings on account of the salts and salts of ammonia from the urine, &c., deposited day by day in the soil.

Sunlight is most beneficial to the cocoanut tree, it increases the number of successive fronds and the crops of fruit, while if much shade is caused by trees of other kinds, there is a tendency in the lower part of the cocoa stem to thicken, while the upper parts grow thin and attenuated with fronds at considerable intervals and little fruit.

Exposure to regular breezes is also beneficial, for the constant movements of the tree tops have a tendency to strengthen and enliven the whole tree. The difference is easily seen by comparison with those in sheltered positions.

The *holes or pits* into which the plants are to be transplanted, should be severally 12 yards or coles distant on backwaters, and where a deep alluvial soil is found 8 or 10 yards are enough. These distances are necessary, otherwise the trees not having room to expand their tops, repel each other and grow in diagonal positions, and are easily blown down or overset. Too close a neighbourhood also tends to draw up the trees into long feeble stems, shoots, fronds, and small fruit. In a level loose soil, the hole should be a cube, of a yard and a half, on hill sides 2 to 2½ yards, but in low grounds half or three quarters of a yard deep with one yard square is sufficient. If the pits are *not wide* and sufficiently deep, the roots soon appear above the surface of the surrounding ground, and the hold upon the earth is weak, nor is sufficient nourishment obtained, and the monsoon storms quickly overturn the tree where the soil is marshy though the hole need only be large enough to contain the seed and roots, and in a cold clayed ground, the holes are filled with sand and the plant deposited in it. Again, in low marshes, banks or terraces should be thrown up and consolidated previous to planting. Should in any of these cases plants of two or three years old be used, the pits should be at least 2½ yards every way The pits should be dug from two to six months before planting, and then prepared first by having heaps of fuel and weeds burned in them, and subsequently by manuring. The fresh earth is supposed to be full of ants and worms and itself injurious to the new plant and to hinder growth; on the contrary there are some planters who deny this statement and think the burning and manure not to be necessary. In low situated plantations new holes may be preferred and quick planting. No time should be lost in the removal from the nursery to the pits: indeed *the day* should not pass, in which case within the month new roots and fronds may be looked for, but where this proves impracticable if the plants are kept cool and in shade, four to six or eight days have been known to intervene, but followed by very great loss in the number of successful trees. Inside the pits smaller ones should be made and filled with salt and ashes mixed with mould, into which the young plants should be planted, with the nuts just covered with this compost. Some shade should be afforded, and care taken that the plants be not shaken or removed from their first position, and occasionally water should be sprinkled over them. The compost should be used when there is but a small proportion of sand in the soil. Ashes will suffice on the sea shore, and sand in marshy and loamy soils. The roots of a plant under a year which are broken (but according to many planters *all* found on the nuts in the nursery) should have their ends cut, as new ones are supposed to be hastened by the process. Turmeric and arrow-root are often planted in the same pits with the cocoanut, as they are supposed in some way to repel white ants, rats, &c. After the plants are in, little pandals or sheds with twigs and branches should protect them for the next six months, from too great heat of noon-day sun, this prevents withering of the leaves or any check to the growth of the roots.

On dry soils the plants should be *watered* twice a day for the first month, once a day will suffice for the next five, or until the monsoon showers come on, and once every two or three days during the dry seasons of three following years, according to circumstances. On hill sides it is usual to water during the hot weather even till the fruit buds appear; and on sandy plains on the sea coast when the trees are in full bearing eight or ten feet of bamboo (with the divisions at the joints broken to from the pipe) is often driven down by the side of the cocoanut tree, and cool water from wood covered tanks is poured down to refresh the roots and lower soil. The soil round the young plant is often too kept damp by a bed of leaves, particularly such as will not be eaten by white ants. If the soil is naturally poor or of an hungry nature, salt, ashes, paddy husk, goat's dung, and dry manures may be applied for the first year, but in after seasons, fresh ashes, decayed fish, carrion or other refuse, is preferable, also oil cake.

(To be continued.)

IRRIGATION IN THE NIZAM'S DOMINIONS.

EXPERIMENT MADE AT THE SHAMEERPETT TANK, IN HIS HIGHNESS THE NIZAM'S DOMINIONS, TO ASCERTAIN THE QUANTITY OF WATER REQUIRED FOR THE IRRIGATION OF RICE CROPS.

This enquiry was first commenced under orders of the Government of India, conveyed in their Circular No. 87 of 1867. The Commissioners in Berar were requested to endeavour to ascertain by experiments and furnish the information required, but no satisfactory results were attained. In a letter No. 222-I., dated 31st May 1870, from the Government of India, it was suggested that, with the concurrence of the Nizam's Government, experiments should be made from the Hoossain Saugor Tank at Secunderabad, and permission was solicited from Sir Salar Jung, the Nizam's Minister. This was readily granted, but at the same time the Minister pointed out the difficulties that would be experienced in connection with that tank, on account of the numerous purposes for which the water was used, in consequence of the largely populated area which was cultivated therefrom, and suggested that the experiments should be made from some other tanks in the neighbourhood, mentioning that at Shameerpett. This tank is situated about nine miles from Bolarum, (14 from Secunderabad), and early in December last, I visited it in company with the Executive Engineer of the Division, Assistant Engineer M. Little, to whom the Surveys were entrusted, and Mr. Condasawmy Moodeliar on the part of His Highness's Government. The season selected for commencing work was at the time the cultivation of the second rice crops in the Deccan commences.

The tank is one of the fine old specimens found in India. It was constructed above 200 years ago at the same time as the Hoossain Saugor Tank was built, but it has been allowed to fall somewhat into decay; and has not, I understand, been fully utilized in the memory of living man. The collecting basin above it is about 75 square miles. When full, the depth of water at bund would be about 40 feet, the area covered by the water would be about 1,375 acres. The depth of water when full, over still of lower sluice, would be 35 feet, and the capacity up to 24 feet above our datum, amounts to 943,700,000 cubic feet, or 34,951,852 cubic yards, enough to irrigate 3,500 acres at the rate deduced from this experiment. Taking the average rainfall of 26 inches, and ·8 as co-efficient of discharge, the possible collection from the whole basin would be 134 millions of cubic yards, but as there are 32 other tanks of sizes above the Shameerpett Tank, it is probable that the full capacity of the latter would never be utilized. The breadth of bund at top varies from 38 to 50 feet. The outer slope is about 2 to 1. The inner slope, faced with coursed stone, is generally nearly perpendicular, but in places half to one. The sluices are of the common native pattern built on the inner slope of the bund, in three stages, all faced with cut stone, with steps leading down to the lowest sluice. This arrangement, though no doubt expensive, simplifies the difficulty of dealing with sluices under great heads of water. In each stage two circular holes (10" diameter) are cut vertically, and communicate with a common masonry tunnel leading right through the bund. These tunnels are laid in solid ground one at either end of the bund. The holes are fitted with large beams of wood passing through openings in the platform above, which are raised according to the quantity of water to be discharged. By this arrangement never more than 10 feet head of water has to be dealt with. The timber used is of a wood called khyr or khyer, a species of babool, and weighs about 70 lbs. to the cubic foot. The botanical name is Mimosa Catechu, or Acacia Catechu. These sluices with ever-varying heads and discharging the water under such peculiar circumstances rendered it impossible to make any reliable calculations as to daily discharge from tank, and after a few attempts the idea of measuring the water used by this means was abandoned. The irrigation commenced in the last week of November, and the level of the water in the tank at that time was taken at the standard level or datum for our calculations. In consequence of the orders of Sir Salar Jung, every assistance was afforded to us in obtaining all the information we required. The plan adopted was very simple. The tank was surveyed accurately, a contour line being run round the level of the water as it stood at the end of November, and other six feet contours were run above that level, in case the water should have risen from any extraordinary causes, such as heavy rainfall, or bursting of reservoirs on higher level, and also to enable the full capacity of the tank to be calculated. At the same time the water was traced from the tank to the different portions of land under rice cultivation, each of which was accurately surveyed. Originally these were reported by the villages to be about 100 beegahs, or 75 acres, but they were proved to amount to 280·28 acres. When the irrigation was completed, the tank was surveyed below the datum level, and so the *gross* quantity of water that left the tank could be pretty accurately calculated, and this after all is the important object to ascertain, as wherever reservoirs exist, evaporation and soakage always dispose of a large quantity of water; and this tank may, from my experience of several thousands in the Madras Presidency, be taken as an average specimen. The bed of the tank is generally of a rocky nature, so no excess soakage took place. Any heavy rainfalls would have rendered our calculations more difficult, but fortunately from the middle of November to the end of May, the only falls at Secunderabad, which may be accepted for Shameerpett, were as noted below,* so all calculations on that account may be left out without affecting the results in any material degree. When the experiments were commenced, a very little stream was found by Lieutenant Little to be running into the tank, but so small that he could with difficulty measure it, and so I have neglected this to notice that.

By way of arriving at some conclusions as to the net quantity of water required, we made arrangements for measuring the evaporation from the tank. On this subject I have never before succeeded in arriving at any satisfactory conclusion. I have evaporated water from pans and from pans standing in other pans, but I always felt the results were excessive, and that the evaporation from a large body of water was considerably less than that shown from pans, owing to the whole atmosphere immediately over the surface of the tank being moist. On the present occasion I ordered a water-tight tin box to be constructed, and sunk it in a timber raft, so that it might float with its edge slightly above tank water level. The box was then filled to tank water level, and the whole floated out a considerable distance from the shore, so that the water in the box was placed almost in exactly similar circumstances as the water in the tank. On two occasions careful measurements were taken of the evaporation during the previous fortnight, other attempts were made, but frequently some trifle happened to render the measurements valueless. Between the 12th and 26th of January (14 days) the evaporation amounted to 2·12 inches or ·1514 of an inch per diem. Between the 27th January to the 10th February (15 days), the evaporation amounted to 2·67 inches, or ·178 of an inch per diem. Mean evaporation ·165 of an inch per diem, and this with the colder weather of December, and the hotter weather of March and April, may be taken as a fair mean. The number of days during which irrigation was going on were 185. The water in the tank fell 11·07 feet. The results my be summed up as follows:—

Gross quantity of water consumed	..	2,591,730 cubic yards.
Area irrigated ...	..	280·25 acres.

During the period of cultivation, no rain fell worthy of notice. Gross quantity of water consumed per acre 9,042 cubic yards. The crop was, it is understood, an average one. It is worthy of notice that the season, not being a very favourable one, the water was husbanded and little or none wasted. Latterly it had to be raised by hand labour, the level of water falling below sill of lowest sluices. The cultivators had complete control over the water. The evaporation represented a depth of water in the tank of ·305 inches; soakage cannot be determined, but for sake of calculations we may reasonably assume it to be the same as the evaporation, and allowing an average area of water, the loss would have been 1,102,577 cubic yards. This would leave 1,309,173 cubic yards as the approximate net quantity of water spread over the land, and which over 280·25 acres gives 4,890 cubic yards per acre, and represents a depth of 36·3 inches. These calculations made under exceptionally favourable circumstances, and with great care agree, I think, somewhat with calculations made in other Provinces. I believe from 7,000 to 10,000 cubic yards of water per acre, in the gross, are generally consumed for rice from tank irrigation, and a rainfall of 36 to 40 inches fairly distributed over a season is, I believe, sufficient to produce an average rice crop, without any artificial irrigation. The survey and measurements were undertaken by Assistant Engineer Lieutenant Little, under the orders of Lieutenant Cumming, R.E., Executive Engineer, Secunderabad Division, and have, I believe, been made with great care and correctness. The climate here is a dry one, and the general level of the country is about 1,800 feet above sea level. These are points that should be noted in comparing the results with experiments made in other districts. The total cost of the experiment was very trifling, or about Rs. 300.

From the Government of India, Public Works Department; to the Resident at Hyderabad, No. 6501, dated the 28th October 1871.

I am directed to acknowledge the receipt of your Secretary's letter No. 200, of the 23rd instant, submitting, for information, a memorandum by the Superintending Engineer, on experiments made at the Shameerpett Tank in His Highness the Nizam's dominions, to ascertain the actual quantity of water required for the irrigation rice crops. In reply, I am to state that the experiments seem to have been carefully conducted, and afford at all events a *practical* result as showing the *gross* amount of water that was

* Experiment made under satisfactory circumstances:—

Week ending	3rd March	 28
" "	10th "	 2
" "	14th April	 2
" "	21st "	 2
" "	3rd May	 2

actually expended on a given area in the cultivation of a particular crop, etc., etc. I am to request that the thanks of the Government of India may be conveyed to Major Mayne and the officers engaged in the experiments, and also to Sir Salar Jung for the assistance afforded by His Highness the Nizam's Government in the matter. The report will be translated for general information, and published as a Supplement to the *Gazette of India*.

"Canal Profits.—The importance to which the irrigation works in Upper India have attained, is made evident by those in the North-Western Provinces alone furnishing during the year a gross revenue of nearly £315,000 and an expenditure of £240,000, making the entire annual transactions upwards of half a million sterling, while the area actually irrigated amounted to a little short of 1½ million of acres, the gross value of whose out-turn cannot, it is estimated, have been less than 5 millions sterling, exclusive of the fodder by which the cattle were sustained :—

	Acres irrigated.	Maunds produced.	Value at current market rates in pounds sterling.
			£
Sugar	97,553	2,009,329	1,056,385
Wheat	507,896	7,916,186	2,633,505
Barley	257,309	2,680,006	486,250
Rice	114,020	1,142,152	367,146
Maize	42,122	333,547	82,699
Millet	93,304	699,693	170,108
Pulses	73,354	601,574	173,532
	1,272,862	15,393,487	4,931,625

The year under review was a very favourable one for the canals, or, in the language of the Government of the North-Western Provinces, "the financial results of the year display an unexampled prosperity." There were 1,441,808 acres irrigated against 983,390 acres of the highest previous year's maximum, a gross revenue of Rs. 31,47,160 against Rs. 21,74,431, and a net revenue of Rs. 21,25,424 against Rs. 12,25,539 of the preceding year. The profits amounted to 8·21 per cent. on a total capital of Rs. 2,58,73,080, invested up to 31st March 1868, in all the irrigation undertakings of the North-Western Provinces, good, bad, or indifferent. These satisfactory results have already been acknowledged by the Government of India, as well as by Her Majesty's Government. The year was characterized by wide-spread scarcity, the mitigation of which, in all the districts within reach of the irrigated tracts, was very sensibly felt, and the areas under irrigation, and their situation relatively with the neighbouring districts, is clearly delineated on the map which is embodied with the report, and wherein it is observed—"The irrigated tracts of the Doab were the heart of the province from which surplus food flowed out by the railways westward to the Cis-Sutlej States, in which there was no harvest to reap, and southward by never-ending trains of camels and carts to Bundelkhund, Ajmere, and Rajpootana, where no grain was even sown. Under Providence, a famine was averted by the combined action of railways and canals." His Honor the Lieutenant-Governor records an observation to the effect that the failing supply of the Jumna renders a reconnoissance of storage sites in the Himalayas advisable, and specifies the river Tonse as presenting favourable conditions at certain points of its course. This is an important matter, especially in connection with the proposed extensions of the Western Jumna Canal in the Punjab. The results of the working of the two chief canals during three years are already shown in the present report. The ratio of cost of revenue management to gross revenue on the Ganges Canal was 14·70 per cent., and nearly corresponds with that of the Eastern Jumna, which is the best organized of the canals in the North-Western Provinces. The areas irrigated by the several canals in the three last years were as follows :—

Year.	Ganges Canal.	East Jumna.	Doon.	Other Canals.	Total.
1866-67	634,734	239,559	6,852	102,245	983,390
1867-68	453,456	182,544	11,068	33,492	701,480
1868-69	1,078,[illegible]	274,101	14,225	75,195	1,441,918

The whole area irrigated is 11½ per cent., about one-ninth of the gross cultivated area of the districts traversed. The proportions of "flow" and "lift" irrigation over all the canals were—

1868-69	Flow 67·4	Lift 32·6
1867-68	" 68·0	" 32·0

and show that to still one-third of the whole area the water has to be raised.

Ganges Canal.—The following table compares the results of the three last years :—

Year.	Capital at beginning of each year.	Profits from direct outlay only	
		Amount.	Percentage on capital.
	Rs.	Rs.	
1866-67	2,48,08,[illegible]	12,25,539	4·94
1867-68	2,52,35,018	8,67,806	3·44
1868-69	2,58,73,080	21,25,424	8·21

and the next exhibits the income and working expenses for the same years of the Ganges and Eastern Jumna Canals, the only important working lines as yet completed :—

Year.	Gross revenue.	Revenue management.	Maintenance charges.	Total working expenses.	Percentage on gross revenue.	Revenue.						Working expenses.						Percentage of profit on capital sunk.
						Per cubic foot of discharge.	Per mile of canal.	Per mile of navigable open.	Per acre irrigated.	Per cubic foot of discharge.	Per mile of canal.	Per mile of navigable open.	Per acre irrigated.					
	Rs.	Rs.	Rs.	Rs.		Rs.	Rs.	Rs.		Rs.	Rs.	Rs.		Rs.	Rs.	Rs.		
Ganges Canal.																		
1866-67	15,53,729	2,33,342	5,06,351	7,82,977	49·78	374	2,367	565	2·416	186	1,179	251	1·069	114	1,297	5·39		
1867-68	13,63,524	2,90,993	4,28,690	8,19,683	60·11	330	2,085	446	2·556	234	1,253	270	1·196	152	1,047	2·44		
1868-69	24,41,539	3,61,349	4,32,873	7,94,222	32·51	525	3,735	745	2·294	171	1,214	255	0·726	163	1,251	8·21		
Eastern Jumna Canal.																		
1866-67	5,67,366	65,444	56,113	1,21,557	21·42	721	4,287	935	4·327	114	986	204	0·695			26·67		
1867-68	4,83,147	72,370	69,093	1,41,463	29·27	519	3,716	811	3·047	152	1,088	257	0·775			13·93		
1868-69	6,25,430	82,595	71,539	1,54,134	24·62	695	4,611	980	2·291	163	1,185	242	0·62			25·47		

The succeeding table shows the cost of establishment, including accounts, employed during 1868-69 on original works, repairs, and revenue, and the percentage chargeable under each heading :—

Chargeable to	Share of Establishment.		Total cost of establishment on each.	Expenditure.	Percentage on each.
	Executive.	Direction.			
	Rs.	Rs.	Rs.	Rs.	
Original works	2,29,116	31,741	2,60,857	9,77,462	26·68
Repairs and plantations	59,097	12,277	71,474	4,35,386	16·42
Revenue management, including navigation	4,04,229	83,967	4,88,196	31,47,161	15·51
	6,92,442	1,28,085	8,20,527	45,60,009	18·00

The working expenses on the Ganges Canal, which had hitherto been so large, owing to the great expansion of irrigation during 1868-69, were reduced from 49·78 to 32·51 per cent. on gross revenue; but on the Eastern Jumna Canal little room remained for expansion, and, consequently the working expenses only fell from 29·27 to 24·62. The conclusion drawn from thence is "that 25 per cent. about represents the working expenses of a fully developed and thoroughly efficient canal conducted on the North-West system." An instructive table is added, in which the increase of irrigation is contrasted with the decrease in rainfall. The percentage of the former varies from 28 in the Agra Division to 142 in Boolundshuhur, while the percentage of the rainfall varied from 30 inches in Bareilly to 67 in Etawah. The relative decrease of rain in Agra and Boolundshuhur differed only as 48·5 and 54·5 per cent.

The following table illustrates the areas irrigated relatively in the two seasons of khurreef and rubbee, showing not only how large a part was performed in the former season compared with that of previous years, but how much further a cubic foot of water was made to go—a fact which reflects great credit to the officers charged with the distribution of the water:—

Ganges Canal.

Year.		Area irrigated. Total.	Per cubic foot of supply.	Total water-rate.
1866-77	Khurreef	181,658	41·37	512,373
	Rubbee	453,076	103·55	893,660
1867-68	Khurreef	185,137	42·06	502,926
	Rubbee	348,319	98·30	675,504
1868-69	Khurreef	344,267	69·63	814,631
	Rubbee	734,132	148·01	1,450,689

A question is raised by Major Brownlow as to the capacity to be given to canals in the North-Western Provinces in relation to the volume available for the irrigation of the rubbee crop, and the advisability of supplying the plough waterings to the full extent of the volume available, as he considers that it was a speculative proceeding to distribute the 6,000 cubic feet available for this purpose in October, when the volume of the canal fell in January to 4,200 cubic feet. The remarks made by Colonel Greathed with reference to this point in paragraphs 33 and 34 are much to the point, and seem, at all events, to be borne out by the successful issue of the season's operations. The following shows the areas of some of the principal crops irrigated as compared with that of previous years, and that there is a steady, moderate extension in the cultivation of sugar-cane and rice, a two-fold increase in the rubbee grains, while the area under indigo remains stationary.—

	1864-65.	1865-66.	1866-67.	1867-68.	1868-69.
Rice ...	22,466	23,134	30,539	36,365	43,355
Sugar ..	50,150	58,416	46,338	55,232	60,654
Indigo .	35,166	47,714	70,487	75,684	75,506
Cotton ..	42,026	10,406	19,094	5,416	44,213
Wheat and barley .	338,071	362,679	400,444	319,715	699,582

Navigation.—The receipts from navigation, which is confined to the Ganges Canal, have increased 10·3 per cent.; but, according to the statement, the articles carried have increased from 27,000 to 45,000 tons. This quantity is, however, still very small compared with the length of the canals opened, *viz.*, 654 miles. In proportion, however, as obstacles are removed and greater facilities are offered, the traffic along the canal and its branches will doubtless increase.

Eastern Jumna Canal.

The extension of area on this canal was but 13,000 acres over the maximum previously reached in 1860-61, but it has now been so carefully worked for so many years that, as observed by the Chief Engineer, little margin remains for expansion. The profit on this canal for the year under review is said to have amounted to 25·37 per cent. on the capital, *vide paragraph 53 of the Report.* But though the absolute increase of area over that irrigated in the famine year of 1860-61 was only to the extent stated, yet the supply of water on the average throughout the year was less, and the duty obtained per cubic foot of discharge was the largest yet recorded, being 90·7 in the khurreef and 315·5 in the rubbee, or 301 acres in all. That one noticeable fact has received confirmation during this year's experience seems evident from the following remarks made by the Superintending Engineer, 2nd Circle, in paragraph 28 of his report: "that the contract system is one in which the interests of the cultivator are identical with that of the Government in the economical distribution of water, is fully borne out by this years' results."

Doab Canals.

These small canals do not improve much in their character as remunerative works, and the Superintending Engineer does not seem to anticipate much further improvement; but, at the same time, his remarks in paragraph 44 of the report are much to the purpose. He observes as follows:—"That the good done to a country by canals is not to be measured merely by the small balance sheet, applies with two-fold force to the Doab Canals; a population has settled along these lines of irrigation dependent entirely on them, not only for water for their crops, but for water for domestic purposes. Close the Beejapoor Canal, and, in two years' time land now producing tea and cereals will be over-grown with jungle."

Jhansie, Humeerpoor, and Bijnoor Irrigation Works.

These yield but an insignificant amount of revenue, and call for no particular remarks.

Rohilkhund Canals.

These canals are working at a loss, chiefly on account of the exceedingly low water-rates charged. A revision of these rates has been proposed by the North-Western Provinces' Government, and is now under consideration by the Government of India. The area irrigated amounted to 70,803 acres, or 2½ times as much as in the previous year. The increase was due to the prevailing drought, only 19·4 inches of rain having fallen during the year. The necessity for these canals is made apparent by the fact that rice forms so large a proportion of the cultivation. In the previous year the percentages of rice and wheat were 56 and 27 respectively, and during the year under review 40 and 36 per cent. A project was recently before the Government of India for remodelling these canals as well as raising the water-rates, and the Chief Engineer's opinion is that, seeing "the amount of deficit occasioned by ceasing to charge water-rate on canal water from natural streams has decreased from Rs. 27,169 to Rs. 4,947, there is every reason to push on the re-construction of these works." Section 6 of the Chief Engineer's report contains an interesting review of the effect of the drought in directing attention to the irrigation of the inferior food grains, nearly 77 per cent. of the total increased area consisting of "*jowar*" and Indian corn, the stalks and leaves of both of which serve as food for cattle, while the grain is consumed by human beings. The following remarks by Colonel Greathed graphically and significantly describe the superior effects of canal irrigation in the North-Western Provinces as compared with that afforded by wells: "But, besides producing food for the support of human life, canal irrigation created sustenance for cattle, which was produceable by no other means, and, at a crisis when wells failed in well-irrigated districts, and herbage and fodder depended on abundant water, the cattle of the Doab were saved, strong to labour in the work of the following harvests, whilst elsewhere those harvests also were reduced by the want of cattle which had been swept off by the drought."

* * * * * * *

"And, lastly, canal cultivators became rich whilst others suffered because they realized both large crops and high prices: the payment of land revenue was assured, the breaking up of communities, the unsettlement of the social system of the country, the loss and dispersion of property, which famine entails, were averted, and a vast sacrifice of life prevented, which, but for the extension of canal irrigation, must have occurred in 1868-69, as it has occurred in the same districts in 1837-38. I trust these results may be pondered by those who recommend dependence on the irrigation to be obtained from wells in a year of serious drought." The amount of relief afforded by special irrigation works undertaken during the time of greatest pressure extended to upwards of two millions people and an outlay of Rs. 4,31,185. The only unsatisfactory matter is the delay in the submission of the report. His Excellency in Council also would have been pleased if something more had been said as to the efforts which it is believed are being made to check the waste of water which takes place over the wide districts, and which it is understood forms one of the greatest agricultural difficulties in the North-Western Provinces.

The Planters' Gazette.

BOMBAY, 21st December 1871.

CINCHONA.

REPORT ON ANALYSIS OF BARK YIELDED BY THE GOVERNMENT CINCHONA PLANTATIONS, MADRAS.

Extract from the Proceedings of the Government of Fort St. George, Revenue Department, No. 1696, dated 20th September 1871.

From J. Broughton, Esq., Government Quinologist, to the Secretary to Government, Fort St. George, Revenue Department, dated Ootacamund, 31st July 1871.

As in my last three reports I have the honour to address analyses, which support the changes in the composition of our oldest barks during the past five years. The following table expresses the amount of alkaloids in the trunk bark of the oldest trees of *C. Succirubra* in the month of May, the period of maximum yield in the respective years. The amount is expressed in percentages of dry bark :—

	1868.	1869.	1870.	1871.
Total alkaloids	6·74	7·42	7·63	7·85
Total sulphates obtained... ...	6·06	6·42	6·08	5·45
Quinine...	2·40	1·72	1·72	1·81
Cinchonidine and cinchonine	4·34	5·71	5·97	6.05
Sulphate of quinine obtained crystallized ...	2·21	1.51	1·49	1·15
Sulphate of cinchonidine obtained crystallized	3·85	4·93	4·61	4·20

The above analyses show that up to May 1871 the total amount of alkaloids in the red bark had continued to increase. But as I had the honour to mention in a report dated 17th August 1868 (Proceedings, Madras Government, 22nd September 1868, No. 334, Revenue Department) as being highly probable to occur, the annual increments diminish in amount—a circumstance which indicates that the bark is arriving at its maximum of yield. The numbers which approximately express the annual increments during the period of my observations are 0·75, 0·60, 0·17, 0·25. The circumstance that these numbers do not accurately express a regular diminution of increment, is doubtless attributable to the difficulty which occurs in collecting in successive years a sample, which shall accurately represent the mean yield of the bark of a large number of trees, together with the difficulty in collecting the samples each year under precisely comparable circumstances. From certain results obtained in the comparison of the analysis of barks that have been treated with moss, with those of the natural unmossed bark, I am strongly inclined to believe that if the bark of our oldest trees has not actually reached the age of its greatest yield, it must have very nearly approached it. As this is a point of some importance, which cannot be held decided without positive proof hereafter being obtained, I here merely mention my personal opinion. In a report appearing (Proceedings, Madras Government, 22nd February 1869, No. 235, paragraph 4), I had occasion to mention that the amount of quinine had diminished during past years in the red barks, although that of the total alkaloids had increased. During the last two years, it appears that the amount of quinine has remained nearly constant, and probably in years to come, its amount will hereafter remain nearly stationary in our red bark. From the above analyses it also seems probable that the amount of obtainable crystallized sulphate of cinchonidine is diminishing with the increase of age. But with the present evidence I cannot hold this yet to be quite clear, since the determination of the amount of crystallized sulphates is apt to be modified by circumstances other than the real amount of pure alkaloid, which latter it only approximately indicates. The large amount of variation according to circumstance of growth met with in the bark of *C. Officinalis*, renders a precise determination of its mean quality a work of great difficulty. I here quote certain analyses of this bark calculated in percentages of its dry state :—

Crown Bark from Dodabetta Plantation.

	I. Trees of good growth, 6 years 9 months of age.	II. Trees of good growth, 8 years 10 months of age.	III. Oldest trees.	IV. Trees of fine growth.
Total alkaloids	5·26	3·10	6·53	6.91
Quinine	3·48	1·62	4·18	4·71
Cinchonidine and cinchonine	1·78	1·50	2·35	2·21
Sulphate of quinine obtained crystallized ..	2·25	1·04	4·17	4·30
Sulphate of cinchonidine obtained crystallized	3·04	1·14	1·37	1·91

Crown Bark from Neddivattum Plantation.

	Trees, 6 years 9 months of age.	Trees, 6 years 2 months of age, of good growth.
Total alkaloids	4·26	6·01
Quinine	2·92	4·19
Cinchonidine and cinchonine	1·35	1·82
Sulphate of quinine obtained crystallized	2·24	4.21
Sulphate of cinchonidine obtained crystallized	1·06	1.39

The above analyses, though comparatively useless to determine the alteration of the bark with age, are adduced as showing the high quality of the barks. Though it falls without my province to speak of the improvement in the growth of the *C. Officinalis* trees, yet I cannot forbear to remark that a low yield in getting much less frequent in their bark than formerly. Both the crown barks of Dodabetta Plantation, which consists entirely of this species, and those of Neddivattum are improving in quality. The increase in the yield of alkaloid is quite apparent, although I cannot with accuracy express its actual amount. This increase is due to quinine, and at present it actually appears probable that hereafter the total yield of alkaloids will equal that of the red bark. These two kinds divide between them nearly the whole of our plantations. For European quinine manufacture, the bark of *C. Officinalis* is admirably suited, as it is rich in quinine. In addition, it is easy to work, and the sulphate of quinine crystallizes with great readiness and purity. It is especially the bark for export to Europe. A small quantity is now packed for sending to England, and I trust that from time to time its export may be continued. In total yield the bark of *C. Succirubra* is the richest, but in its natural state at least, this consists mainly of cinchonidine, cinchonine, and occasionally quinidine—alkaloids which custom and the addition of fresh names, coincident with the first separation of these substances, have kept out of extensive therapeutical use. The medical reports of the Cinchona Commissioners of the Indian Presidencies, and the report on the medical use of "amorphous quinine" appear to indicate that these alkaloids, and consequently red bark, is the kind that can be employed most usefully in India. In Europe the price of the natural red bark will hereafter sink, when it is brought into competition with crown bark. How far by careful special cultivation of the red bark it may hereafter be possible to modify this result, it would at present be premature to speculate.

After the above kinds, the most important at present cultivated on the plantations is undoubtedly that of *C. Calisaya*. As in my former reports the trees of Calisaya were very young, it is quite natural to find the amount of alkaloids in the bark has increased. The most remarkable point about the plants of *C. Calisaya* is the great number of varieties. These display almost every habit. As it was necessary to examine the bark of the trees of most marked character, in order to determine the kind most suitable for cultivation, these varieties have taken up much time. I have the honour to quote the analyses of several of these varieties. The alkaloids are given in percentages contained in dry bark :—

Trunk Bark of C. Calisaya grown at Neddivattum.

	I.	II.	III.	IV.	V.
Total alkaloids	2·95	3·93	5·26	4·16	5·36
Quinine	2·07	3·18	1·92		4 67
Cinchonidine and cinchonine.. ..	1·28	0·75	4·26	b	0·69

These represent fairly the different yields I have met with among the kinds of *C. Calisaya* raised from seed obtained from Mr. Money. They are, as a whole, of good quality; but No. V., or the bark of the variety with broad leaves, which are red in the under-surface and of vigorous habit, is the kind which should be propagated, as it is the one whose cultivation can be most profitably extended. I have examined the bark of several other varieties beside those whose analyses are given above, but find them all inferior to No. V.,* and promising nothing remarkable in their qualities. The bark of our *C. Calisaya* is of excellent quality, and is better suited for quinine manufacturer's use than that of *C. Succirubra*. I regret that the larger number of the trees has not been planted, but as the yield of bark from the present plantations will shortly be so large, I cannot now recommend any considerable extension even with this sort.

In a report appearing in Proceedings, Madras Government, Revenue Department, No. 334, paragraphs 22 and 23, I had occasion to remark that in the barks of the *C. Succirubra* and *Officinalis*, a high mean temperature appeared unfavourable to the production of quinine, that alkaloid occurs more readily in the bark of trees grown at high elevations within certain limits. I have met with a remarkable illustration of this principle also in the bark of *C. Pavoniana*. The bark of this tree, grown at Neddivattum, generally contains no quinine whatever, and at best contains it in so small an amount that it is with difficulty it can be clearly detected. But the Superintendent of the plantations has, with great judgment, experimentally planted several of these trees at Dodabetta plantation, where they grow with much difficulty from the cold being too great for them. An analysis of the bark of one of these trees gave the following results, to which, for comparison, I attach an analysis of the bark grown at Neddivattum :—

Dodabetta.		Neddivattum.	
Total alkaloids	2·06	Total alkaloids	4·26
Quinine	0·79	Soluble in ether	0·41
Cinchonidine and cinchonine..	1·27	Cinchonidine	2·20
		Cinchonine	2·26
Sulphate of quinine obtained crystallized..	0·67		
Sulphate of cinchonidine obtained crystallized.	0·94	Sulphate of cinchonidine obtained crystallized	1·80

Though the bark of *C. Peruviana* from Neddivuttum contained a small amount of alkaloid soluble in ether, it was not quinine. But by growing the same species at the higher elevation of Dodabetta plantation, its bark quite alters its character, and yields in analysis an amount of pure quinine, which readily crystallises as sulphate. Indeed the bark thus grown, far more resembles the bark of *C. Succirubra* than a grey bark. I cannot but consider this instance of a total change of alkaloid, by increase of elevation, a most interesting one.

The occurrence of several remarkable varieties among the trees raised from seed has directed my attention to the occurrence of hybrids among our species of cinchona. In one instance I was able from the account given by Mr. C. Dawson, then Assistant Superintendent at Neddivuttum, to directly trace the origin of a very beautiful plant, which was found to be a hybrid between *C. Succirubra* and *Micrantha*. This plant was picked up a seedling under a tree of the latter. I analysed its bark and found its yield was *poor*, but represented a mean between the qualities of the two species. Examination among seedling trees led to the discovery of many other examples of hybridism, especially to cross breeds between *C. Succirubra* and *Officinalis*. In 1870 I communicated a short memoir on the subject to the Linnæan Society.* The occurrence of the demorphic varieties *macha* and *hawbra*, in species of cinchona was shown in this communication to render cross breeding highly probable, in the same manner as has been shown by Darwin to occur in *primula*, *oxalis*, and other plants. I learn from the discussion which took place on the subject at the Society's meeting that the fact of the tendency of cinchona to hybridism was considered proved. Since that time I have made numerous analyses of the bark of various hybrids that I have observed, but in no one instance have I found any of special excellence. In fact, it appears to me that these hybrids combine the bad qualities of both the parents. I therefore do not quote the analyses.

* Read March 3rd, 1870.

I cannot but think that this ready hybridism between the species of cinchona affords an explanation of the occurrence of the numerous *varieties*, which have been recognized by botanists. I observe, for instance, that a most recent classification gives 38 undoubted species, and nearly 80 separate varieties of cinchona. On our plantations there are several plants which, though certainly hybrids, would undoubtedly be made into species by a botanist ignorant of their origin. It seems, therefore, not improbable that several species, to which a separate name has been attributed, may be only South American hybrids. It is to be hoped that in any future botanical classification of the genus, this circumstance may be borne in mind.

This fact of the inter-breeding of the species renders the seed of a tree, surrounded with many others of a different kind, subject to considerable uncertainty of producing all plants like its parent. As a fact the seeds of the variety I called provisionally *lanceolata* gave but few plants which resembled their parent, and consequently the *seedlings* had to be discarded. As the tree producing the seeds was surrounded on all sides by the ordinary crown barks, the variation in the seedlings becomes intelligible.

I observe that Dr. Weddell in his "Notes sur les Quinquinas" (Annales des Sciences Naturelles, 5 e. serie, Tomes XI. and XII.), and at the suggestion of Mr. Howard, calls the valuable variety I called *lanceolata* above alluded to, *Cinchona Officinalis, Complandiana, Angustifolia* remarking that *lanceolata* does not express so well as *Angustifolia* the peculiar shaped leaf. I would suggest that the name *Angustifolia* be, in future, adopted as the name of the variety.

In several preceding reports I have abundantly stated my convictions, and their grounds, for considering that living cinchona bark has its yield of alkaloids injured by exposure to sunlight. The experimental evidence of this already adduced appears to me to be quite conclusive of the fact, so that further proof is scarcely needed. Further proof appears, however, in the circumstance of which I have been for some time aware, that the bark of opposite sides of the same tree differs in yield of alkaloids. This, of course, is only fully apparent in trees that are equally exposed to sunlight on each side, which from the site of the plantations, does not generally occur. But the following analyses express the yields of the bark taken respectively from the north and south sides of a tree which is equally exposed on all sides. The bark was taken July 25th, 1871:

	North side.	South side.
Total alkaloids	3·15	3·80
Quinine	0·62	1·40
Cinchonidine and cinchonine	2·53	2·40

As the sun has been on the north side of the tree for the last four months, the effect has been that the yield of alkaloids has been diminished 0·68 per cent. This decrease apparently consist of quinine which is commercially the most valuable of the alkaloids. This effect has been produced in spite of its being the most cloudy period of the year.

TEA.

THE MANUFACTURE OF BRICK-TEA.

BY JAMES MACPHERSON.

THE commerce in brick-tea is so extensive among the people of Central Asia, that it seems wonderful so little should be known on the subject. Kiachta, frontier town in Eastern Siberia was, up to the year 1861, the principal mart for brick-tea; the monopoly, held by a first-class guild of Russian merchants, was abolished in that year, however, and in 1862 the frontier custom-house was removed to Irkutsk, since which time tea has entered the portion of Siberia eastward of Lake Baikal, free of duty. Moreover, the importation of sea-borne tea was legalised in April, 1862, in spite of strong protests from Kiachta; this was intended to put a stop to the contraband trade, and the high prices charged to consumers by the Kiachta monopolists. In spite of these things, however, 7,083,029 lbs. of brick-tea are known to have been imported at Tien-Tsin, for Kiachta, in 1868. This is only a fraction of the trade, as Kiachta is only one of the many marts for the article. Some attempts have been made, on the part of the Indian tea planters, to invite the Tibetans and others to deal with them, but (so far as brick-teas are concerned) without much success. This may be due to the general ignorance prevailing as to the proper method of manufacture. It is generally admitted that the coarser leaves are used. After the green leaves have been steamed they are kneaded into a pasty mass; this kneading, under the hands, effectually rids the leaf of the bitter juices which are so very undesirable; moreover, it prepares the leaf for the future compression in some way not clearly known at present. I am disposed to believe that this kneading process with the hands is a mere variety of practice, and that it is frequently set aside; in such case the leaves are pressed into moulds directly the steaming is completed. Mr. C. M. Grant, of Kiachta, (the well-known proprietor of the Overland North China Telegraph Agency), says the coarser leaves are moistened by steam, and then compressed in moulds in the shape of bricks, which are stacked so that the air may freely circulate and dry them; this is for green brick-tea; black brick-tea is fabricated from the refuse as black tea, or the siftings of the teas prepared for the European markets. In England the steaming process seems to strike the mind as a fallacy at first, but this arises rather from its being so very different from the ordinary descriptions of the method of preparation, than from any real defect or difficulty in the process itself. The allusions to the manufacture of brick-tea in the English language are exceedingly rare. It is mentioned in the *Asiatic Journal* (I think) that in the reign of Jin-Tsung (A. D. 1023-63) teas were of two kinds: the first kind called *Peen-tcha* was the leaves combined together in a mass in the form of a board, and then dried by the action of fire; the second kind was called *Sun-tcha*, being the leaves reduced to powder. Steaming seems to have been known long before this time however, and some Chinese authors consider it to have been the earliest known method of manufacture. Von Siebold mentions a method of steaming used in Japan for the preparation of green teas; he says the leaves are laid on mats, in a square box or chest, into which the steam is introduced from a kettle. There are undoubtedly a very great many methods, just as there are in the preparation of ordinary teas, and further information is very desirable as to the means employed by the Russian agents in the interior of Hupeh (Hu-kung) for steaming the leaf; also as to when the leaves are gathered for this tea, the description of mould in which the tea leaves are pressed, the mode of obtaining the pressure, the ordinary time employed in drying the bricks, and the temperature of the air and general state of the weather, &c. Full information on these subjects would be highly valuable to the Indian tea-planter, and benefit commerce generally.

[The Editor of *The British Trade Journal* will be obliged for any facts relating to the above subject, with which gentlemen residing in the interior of China may favour him.]

ESSAY ON TEA.

The Judges appointed to consider the merits of the essays sent in response to the offer by the Council of the Silver Medal of the Society of Arts for the best treatise on the profitable production of tea, have sent in their report, upon which the Indian Committee passed the following resolution, which has been adopted by the Council:—"The Indian Committee, under the recommendation of the Judges appointed, is not in a position to recommend the Council to award the medal, but it gives commendation to the essay of Mr. James Macpherson, of 49, Hereford-road, Westbourne Grove, as containing much information as to the growth and manufacture of tea in India." The Judges were Major-General Henry Pelham Burn, Dr. Archibald Campbell, and Robert Fortune, Esq.

INDIAN TEA CULTIVATION.

Dr. Archibald Campbell writes as follows:—"I have the pleasure to send you a memorandum on the tea cultivation of Lower Bengal for last year. It shows a total export of more than 11,000,000 lbs., being nearly 3,000,000 lbs. increase over the previous year. For the present year, even at the same rate

of increase, we may reckon on 15,000,000 lbs. as the amount of export. To this for all India, has to be added the produce of Kumaon, Dehra Dhoon, Kangra, and the Neilgherries. For Darjeeling, the information given the produce for 1869 only. For the rest it may, I believe, be reckoned at more than double, or 1,000, when the Indian teas were first exhibited in London, the total produce was reckoned at 2,000,000 only; so that the steady increase may be considered satisfactory. There is no doubt, I believe, of the great future that is in store for Indian teas, not only in England, as their excellent quality and perfect purity become better known, but in all the extensive tea-consuming countries north of the Himalayas, when the Indian Government takes real pains to procure safe and easier transit in that direction. In Assam, there are 260 plantations, containing 38,200 acres under tea, which produced last year 4[illegible] lbs. of tea. In Darjeeling, there are 44 gardens, having a cultivated area of 10,067 acres, which yielded 851,549 lbs. of tea in 1869. In Sylhet there are 22 gardens, having 2,240 acres cultivated, which produced 239,902 lbs. In Cachar there are 115 plantations, and 24,574 acres under plant; the produce last year was 4,009,582 lbs. of tea. The other districts such as Dehra, Chittagong, Hazareebagh, and Lohardugah, contain only a few gardens, have not furnished proper statistics. There are but few imported coolies in Sylhet and Darjeeling, but in Assam there were 21,667, but the returns are not satisfactory. Cachar had 14,776 labourers under contract, and 15,000 time-expired men. About 200,000 rs. were remitted to Cachar during the year. The quantity of tea exported from Calcutta was 18,434,000 lbs., against 8,789,344 lbs. the previous year, showing an increase of 9,644,651 lbs."

AGRICULTURAL STOCK AND TEA PLANTATIONS ON THE NEILGHERRIES.

From the Commissioner of the Neilgherries to the Secretary to Government, Revenue Department, Fort St. George, dated Ootacamund, 25th February 1871, No. 16.

G. O., 23rd January 1871, No. 112, directs me to place certain orders on the unanswered file for the half-year ending 31st December 1870, viz:—Order, 30th March 1870, No. 411, paragraphs 5 and 6. Order, 19th December 1870, No. 2072. The last-named order was replied to on the 25th January 1871. I now reply to the first Order.

I. "Desiring to be furnished with any suggestions for adopting "measures calculated to improve the agricultural stock of the Neil-"gherries, and for assisting in procuring a superior description of "plant for stocking the tea plantations."

The first part of the order respecting agricultural stock was replied to in my letter to the Board of the 6th November 1869, No. 58, in answer to proceedings of the Board, No. 745, of the 3rd February 1869. I now forward copy of that letter and its enclosures. With respect to tea planting, I have been for some time in correspondence and consultation with most of the Neilgherry tea growers, with a view to place before Government a definite proposal for the encouragement of tea cultivation up here. From the tenor of the various replies I have received, I have somewhat changed my opinion as to the way in which Government aid had best be given. I find that the tea planters are nearly unanimous in thinking that it is not so much seed of a superior description of tea plant that is wanted here, as the knowledge of some economical, manageable, and effective mode of manufacture. By this time, after repeated failures, the varieties of China hybrid and indigenous tea plants have been imported, and are established on the Neilgherry plantations; and some of the proprietors are prepared to supply as much tea seed as is likely to be wanted for some time to come, and object, not perhaps without reason, to Government interference with their market. Great difference of opinion prevails (as was to be expected) among those interested in tea growing on the Neilgherries as to the way in which Government might render aid. On the whole, however, the suggestions offered may be reduced to four:—

I.—That there should be free tenure of the land for a certain number of years.

II.—That Government should introduce the best mode of manufacture by the importation of Chinese or Assam experts, or by accrediting some qualified European to the tea districts of Northern India, in order that he may make himself master of the most approved methods of manufacture there, and instruct us here.

III.—That the Commissariat should be directed to call for tenders and purchase Indian teas instead of China as hitherto.

IV.—That a quantity of China, hybrid and indigenous Assam tea seeds should be imported by Government and planted out in separate patches at a distance from each other, so as to prevent hybridization and enough to get seeds true to their kind, which is not always the case with the seeds purchased from private gardens.

The question, but the satisfaction on interview have last year [illegible] the Governor and the Members of Council on the subject of the first suggestion. I have written all I have to say on the same subject in my letters* to the Board, which are, I believe, still before Government, and on which final orders have not yet been received. I will only add that if the principle of free tenure for a time is one that can be recognised at all anywhere, tea planters on the Neilgherries have special claim to the indulgence.

In Assam, Cachar, Chittagong, and in Darjeeling, and other hill districts of Bengal, climates congenial to the tea plant are found, and the growth and manufacture of tea are thoroughly established there. But in Southern India tea cultivation is at present date; and, although the plant will live and grow almost everywhere, soil, climate, elevation, labour, manufacture, and communications have all more or less to say to the success or failure of a plantation as an investment. On the Neilgherries the effect of all these is not yet known. A planter who, as a pioneer, employs his capital in the formation of a tea estate in the south of India, incurs risks beyond those of ordinary agriculture, or even of coffee planting, and may therefore fairly ask Government to forego the rent of the land until he has had time to ascertain whether or not his tea will yield him a profit. As regards the second suggestion, one thing is pretty certain that hill teas excel in flavour; but the hill plant yields less leaf, and the leaf weight for weight, wants the strength of Assam and other teas grown at lower elevations. On this account manufacture is all-important on hill states. Given a suitable soil, climate, and elevation, the tea plant here will produce *flushes* of leaf in considerable quantity, and so far the Neilgherry planter, who has some knowledge of tea growing, can see his way. But then comes manufacture on which profit and loss mainly depend. It will be within the recollection of Government that four tea manipulators were engaged for two years, brought down from the North-West Provinces, and placed in February 1869 upon the Neilgherry plantations of Messrs. Mann and Rae. Mr. Collector Grant† was under the impression that "considerable benefit resulted from the instruction of the tea manipulators." I am, however, rather disposed to think, from what I can learn, that the benefit was not great. Mr. Ouchterlony, who was managing Mr. Mann's estate at the time, wrote‡ on the 15th November 1864 that their (the tea manipulators) conduct had been good; "but, beyond showing "the detail of manipulating and use of the various utensils, they "cannot give instruction on the general work * * *, and the result "of their own work in preparing tea was an article inferior to "what the overseer and his own men prepared." Mr. Rae wrote§ "They will introduce a new era in the manufacture of "tea into the Dehra Doon and North-West. The tea they first "made for me has cost me more than they here cost the Govern-"ment." If Government admitted the necessity of doing something more towards helping on *manufacture* here, I should not advise a fresh importation of native manipulators.

There are scarcely two estates here on which the mode of manufacture is the same. But an intelligent man, by attentive inquiry on the spot in old tea districts, would surely be able to determine which is the best plan, and afterwards instruct others in the process. An expenditure by Government of 3,000 or 4,000 Rupees in the employment of such a man for a few months might, I think, set the point at rest once for all; and it would be in this direction, if any, that I should like to see the Government take action rather than import more native manipulators. Year by year tea cultivation in India is assuming proportions which would justify the expenditure of a few hundred pounds to aid, if it be found really necessary, in developing an industry which promises to be of great national importance. When tea planting in the North first attracted notice, experimental estates were opened by the Government of India at great expense, and seeds and seedlings were given *gratis* to the public. The result is that several districts in the north are now studded with tea estates, worked by private individuals. There is every probability that tea growing on the Neilgherries can be made to pay when worked under proper conditions of locality and management, if the difficulty of manufacture can be satisfactorily solved. The Agricultural and Horticultural Society of India have offered a medal and 500 Rupees for the best essay on tea cultivation. The essays are to be in Calcutta by the 1st proximo. One I know has gone up from this district. It would be well to await the result, and see if the prize essay affords such information on *manufacture* as to obviate the necessity of Government moving in the matter. The third suggestion that the Commissariat should be called upon to purchase Indian teas is one that I cannot support. Such an artless mode of protection might find many advocates in America, but infant industries with us must be content with less easily discovered props. The attention of the Commissariat Officers might be drawn to Indian teas; but, in the interests of economy, they must be left to purchase the best tea they can find at the lowest figure. Before commenting on the fourth suggestion, I should like to

* See Collector 1869, No. 140, Board's Proceedings No. 1891 of 18th March 1870; 7th May 1870, No. 60, in Board's Proceedings No. 6011 of 6th September 1870.

† Letter, 2nd March 1864, No. 19, in Proceedings of Government, Revenue Department, 20th March 1864, No. 162.

‡ Proceedings of Government, 20th December 1864, No. 313.

§ Proceedings of Government, Revenue Department, 9th January 1865, No. 314.

await Mr. McIvor's return from Bengal, in order that I may with him go over the small Government tea estate here, to see its condition and note what varieties of tea plants we have. In conclusion, I venture to point out the importance of encouraging tea planting to the utmost, with a view to the development of the resources of this and other Hill plateaus. Native hill cultivation is unimportant. The great staples of the low country cannot be raised here on account of the climate. Distance from markets and cost of transport tell heavily on agricultural industries which raise bulky or perishable articles. Coffee pays best at lower elevations. As cinchona produce is a medicine and not an article of food, its cultivation will too soon find a limit. The increased expense of living in India and the greater facilities of communication with Europe make the advent of mere settlers more and more improbable. Tea, therefore, growing, as it does, in climate attractive to Europeans, seems to me to afford the best hope of inducing any number of them to people our Hill plateaus.

From the Commissioner of the Neilgherries to the Secretary to Government, Revenue Department, dated Ootacamund, 11th September 1871, No. 67.

Your official memorandum dated 1st September 1871, No. 167. I have the honour to forward Mr. Brace's essay on tea culture for the perusal of Government. Mr. Brace informs me that the Secretary of Agri-Horticultural Society of India has written to him to say that it has not yet been decided to whom the prize of 500 Rupees is to be awarded.

From the Commissioner of the Neilgherries to the Secretary to Government, Revenue Department, dated Ootacamund, 20th September 1871, No. 70.

Your official memorandum, No. 167, dated 1st September 1871.

In my letter of the 25th February 1871, I said I would await Mr. McIvor's return from Bengal before reporting on the desirability of Government importing further China hybrid and indigenous Assam tea seed and forming separate plantations of each at a distance from one another to prevent hybridization. I have since then been over the Government tea garden behind Dodabett two or three times, and went again on the 12th instant with Mr. McIvor, from whom I learn that we have 4,750 seven-year old tea plants and 2,500 young plants. Of the old plants about half are Assam and quarter the hybrid variety. The plants in the garden looked strong and healthy, and would furnish an immense number of cuttings if there was a demand for them. Mr. McIvor was of opinion that propagation by cuttings would prove more satisfactory than by importation of seed. Under these circumstances might be put down a few thousand cuttings of each variety of tea plant for distribution to planters *gratis*, or at some nominal price. This, I think, would meet present needs. Hereafter, when there are gardens of tea paying and land is being taken up actively for tea cultivation, Government might consider the question of adding in the importation of seeds of the various varieties. In June last I received an offer from Captain Jennings to lease the Government tea garden for 150 Rupees per annum. Subsequently, in August, he modified his offer to the purchase of the leaf, and I have accordingly desired Mr. McIvor to arrange with him the price per pound, and to keep an account of the quantity of leaf picked and sold that we may know how much an acre of a certain age plants will produce.

If the annually increasing importation of Indian tea into the London market is meant to continue, it must do so under conditions which will not only multiply its popularity, but sap the associations which supported a taste for the China herb even before the hybrid product of Assam had been discovered, and which have continued to keep alive a partiality for it in spite of its inferiority to the plant of our Bengal gardens. Celestials have done much of late years to engender a distrust in the public mind of England of their honesty. A goodly quantity of the stuff exported from China as tea, has been discovered, on analysis, to be an abominable adulteration of willow leaves and steel-filings, together with used-up tea leaves renovated, artificially faced, and mixed with earthy colouring matter, besides "a great deal of dirt and filth." A single shipment of this vile compound consisted of 500 chests from Shanghai. Other invoices smaller in bulk, but numerically very large, aggregating some thousands of pounds, are yearly disseminated through England by the agency of petty dealers skilled in the art of alloying. Anxious enquiry has been suggested by the practice, in respect to how far the law is potent to step in and check this wholesale deterioration of a herb, which long habit has rendered so grateful to the palate. But the law, it would seem from published accounts, is powerless to interfere and circumvent the fraud, though admitting the necessity for special legislation. But where the law is so lax and toleration so charitable, it may be doubted whether very important or beneficial results would follow were the State even to provide against the nefarious systems adopted for "bettering" a staple. On this head, Dr. Scoffern of London, says:—

"Not all chemists, however, have accepted a chemical standard in the matter of adulteration. One chemical professor, who gave evidence before Mr. Scholefield's Select Committee on adulterations, seems to hold opinions of purity, impurity, adulteration, &c., more vague and undefined than any held by the public. The gentleman in question admitted that, in respect of gin, after the publican had weakened it with water, and subsequently reproduced the semblance of strength by the incorporation of other materials, no injury was committed on the public by the sale of such result. He maintained that the article ultimately sold was sold at a fair price, and therefore was not an adulterated article. Such was the testimony given by a Professor of Chemistry to the Pharmaceutical Society, and colleague to the late member for St. Albans. Surely this is loose morality to say the least of it."

Loose, however, as it doubtlessly will and must appear to persons of rigid principles, as we have before seen, the law cannot interpose to establish a healthier tone of morals, for so long as principles and interests conflict, a large margin of credibility must be entered on the debit side of charitableness. With the enlisted responsibility of professional experience, rogues have felt their hands strengthened and their dishonesty authorized under scientific analysis; they have waxed fat, and pursued with renewed ardour the simple method of multiplying their unholy gains at the expense of a little ingenuity. The public has suffered in health as a matter of necessity, but the public is tolerably well contented to suffer when it is told, *ex-cathedra*, that its forbearance is indispensable to the promotion of rascality. We find precisely the same moderation used in tea adulteration. Most people are aware of the unenviable repute into which the aloe has fallen. They may remember the couplet:—

"Porto and China now farewell, for we've the aloe divine,
Its leaves make all the tea we sell, its fruit makes half our wine."

If we substitute for the aloe some other ingredients we have enumerated, and base our conviction of the theory of tea adulteration as it now prevails, on the published experience of analytical chemists, we shall find the substance sold in England as China tea, not a greatly villified compound. As science has advanced, adulteration has become easier, and manipulation more dexterous. It is a well-known fact that establishments, having for their object the manufacture of spurious teas from the leaves of other than the tea plant, once existed in London, though it is probable they have been for some time past defunct, but the art they practised is yet alive, and the production of fictitious tea from exhausted leaves impregnated with colouring and flavouring substances, is abundantly evident. The notorious chicaneries of the modern Babylon, we purpose making the subject of a future article, confining ourselves for the present to a consideration of imports from China.

By far the largest amount of tea adulteration is carried on by those skillful operators, the Celestials, in their own country. These expert rogues, says a modern writer—"in whom the imitative faculty is so strongly developed that their artists will even depict each small-pox indentation on the face of a sitter"—experience no difficulty in palming off upon the "outer barbarians" adulterated tea. To fashion tea dust into the appearance of dry leaves, to make black tea blacker, and green tea greener by artificial means, are some of their pleasantest diversions. The disguising substances employed being seldom unobjectionable in a sanitary sense. By means of plumbago, a rich, deep, black colour is obtained, an increase of greenness and a lustrous sparkle are imparted to green tea by a mixture of talc powder, turmeric, and Prussian blue, a substance, which, if not positively poisonous, is, notwithstanding its toxicological inertness, highly indigestible. Mr. Warrington, of Apothecaries' Hall, is the chemist to whom must be allowed the praise of having fixed upon a determination of the methods by which tea is adulterated in China. He states:—

"I examined the article of tea some years back. In 1844, rather accidentally than otherwise. I was drawn into the examination more as a point of chemical interest. Two samples of green and black tea were brought to me by an excise officer, who had made a preliminary seizure in the neighbourhood of Kennington. He wished to know if those were genuine teas. I requested him to get further information as to the identification of the samples with the bulk of the teas, and he was to see me again. The samples lay before a window, and one day seeing the sun upon the surface of the green tea, I was very much surprised with the sparkle thereof. I then examined it microscopically, and I found the whole of this tea was faced with a colouring material. On calling at one of the large tea warehouses, and mentioning what I had observed, they said immediately 'Have you examined the unglazed tea?' I was very much struck with the term unglazed. I asked them what they meant by 'unglazed tea.' They said 'we have two kinds of tea in the trade; what is called glazed tea and unglazed tea.'"

Mr. Warrington was shown a specimen of unglazed tea which he describes as of "a dull slate colour." On examination he found no turmeric, and very little Prussian blue, but a quantity of sulphate of lime upon the surface. Now, upon the refuse dust of tea leaves can warrant the [illegible]

abominable mixture that passes—less now than in former years—in the London market, and is vended by wholesale and retail dealers for China tea, is nothing more than we have previously described. In China the process of sophistication is simple, consisting of a preparation of gum, brown earthy matters, and a little tea dust fashioned into the external appearance of tea and dried. This compound is produced for the special delectation of barbarians, under the appropriate designation "fie" tea. There is a germ of honesty in this appellation peculiarly gratifying, when we take into account the characteristics of our "Celestial" friends. Having enacted a falsehood by producing the mixture they seem to compound with conscience in their selection of a suggestive title for the filthy product.

It has frequently struck us as singular that so large and influential a body as the tea planters of Bengal, have never, for their own protection, exerted themselves for the formation of an associated Agency in London. We have frequently urged upon their consideration the immense advantage such a body would confer; the accession of power in moving the Indian authorities by extraneous pressure and parliamentary discussion, by the publicity of advertisements and ventilation in the first-class Metropolitan journals, and by means also of minor instrumentalities such as are unavailable in India. As the law reads, a custom-house official in London is not empowered to seize and confiscate the deleterious compounds now imported for home consumption, though he may know the same to be detrimental to health if used as beverages. It is matter for very serious deliberation, whether a system of inspection should not immediately be introduced in the interests of sanitation and public safety, and this is one of the essential measures a "Planters' Association," duly represented in London, would soon succeed in establishing. A good deal may also be urged on the advisability of popularising Indian teas at home by means of published reports of chemical examinations, correspondence with various societies, statistical information on Indian tea gardens, &c., by which invoices, with the exception of small reserves, might be bespoke long previously to arrival, at urrente market rates, or even more favourably, if the supplies were guaranteed to come regularly to hand. In this way also attested samples could always be made available to refute the suspicion of impure teas being made to do duty as genuine India manufacture. The advantages and facilities to planters would be, we believe, considerably greater than those we have enumerated, if they would but combine for the furtherance of the common object. In our next notice of the subject, we hope to offer a few more useful hints to such of our planting friends as may feel interested in the perusal.—*Bengal Times.*

PRUNING OF TEA:—BY GEORGE KING, M. B., F. L. S. LATE DEPUTY CONSERVATOR OF FORESTS, KUMAON.

(From the Journal of the Agricultural and Horticultural Society of India, Vol. III., Part 1.)

ALTHOUGH it is about a quarter of a century since its cultivation was begun in the North-West Provinces of India, only a few years have elapsed since tea first began to be seriously looked upon as a garden crop, and to have the commonest principles of horticulture practically applied to it. The idea that guided tea planters in these provinces for many years, appears to have been that tea is a kind of forest crop, on which high cultivation would be thrown away, and in fact that hoeing and manuring were likely chiefly to stimulate the growth of the rank grass and weeds that still disputed possession of the soil (usually only too successfully) with the Chinese exotic, to the success of which they were looking for the realization of their fortunes! In consequence of their attachment to such ideas, they did not consider a practical acquaintance with farming or gardening as of prime importance in the manager of a plantation. Great energy indeed was often displayed in planting out tea bushes, but none whatever in caring for them afterwards. *Laissez faire* was really the motto, and the practice was thankfully to collect what seed and leaves the bushes might yield, and by the aid of a Chinaman, (who might or might not have had anything to do with tea-making in his native country), to convert the latter into as good tea as possible. Among the ordinary operations of gardening in respect of which tea had been until very lately quite neglected is that of *pruning*, and on the *rationale* and practice of this I now venture to submit a few remarks:—

The tea gardens of the North-West Provinces are located either in Dehra Dhoon, a district lying at the base of the Himalayas on a plain about 2,000, or 2,200 feet above the level of the sea, or on the lower and outer ranges of the Himalayas in the provinces of Garhwal and Kumaon, at elevations varying from probably 4,000 to 7,000 feet.* With a few exceptions not worthy of mention, the kind of bush laid out in these gardens is the Chinese planted in clumps at distances varying from 6 × 6 feet to 4 × 4 feet. The appearance presented by many of the clumps unpruned tea of various ages that may still be found in plantations in Kumaon, is that of small stunted masses from 1½ to 2½ feet in height, and about 3 feet or a little more in circumference. If examined, each clump will be found to consist of some gnarled and usually lichen-covered stems which give rise to a few crooked warty branches, that carry towards their tops a tangled crowded mass of short hard twigs, bearing some small leathery rather yellow-coloured leaves. A young healthy shoot coming straight from the roots is hardly to be found. At the appropriate seasons, this general appearance is modified by the presence of faint flushes of young and green leaves, by masses of flowers, and by loads of seed. Looked at from above, one of these clumps presents a rounded dense surface of small short twigs, and looks solid enough to afford a comfortable seat to a man of moderate weight! It need not be added that the yield of useful leaf on an acre of tea of this sort is but small. The condition above described is in some respects an extreme one, and is that assumed by unpruned tea in the higher plantations on the hills, where apparently the tea-plant is fighting against heavy odds in the matter of climate, and is in a state where the *laissez faire* system of treatment is particularly inappropriate, and where a little attention to other operations besides pruning (such as hoeing and manuring) would produce the most marked effects.

In the moister, warmer, and in everyway more genial climate of Dehra Dhoon, unpruned tea-clumps* are of greater size, and the stems and branches are less gnarled and lichen-grown. The leaves are also larger, and the flushes in the rains more vigorous.

The yield of seed used in Dehra as in Kumaon to be large; and this fact is quite in accordance with general experience, for it is a matter of common observation that many species of plants, when grown under circumstances not natural and unfavourable to them, have an excessive tendency to run to seed, as if, feeling themselves to be in a dying way, they were determined to do their best as an expiring effort, to continue a progeny to another generation. The appearance of untended tea in the higher plantations of Kumaon is particularly suggestive of the existence of such a struggle for life against adverse circumstances.

As long as tea-seed remained a marketable commodity, there was some show of reason for continuing a system of cultivation, or rather no cultivation, which undoubtedly favoured its production in quantity, though the quality must have been poor; and doubtless pruning would have been resorted to sooner, had the demand for seed (concomitant with the mania for extending cultivation) ceased earlier. Both have now ceased, and such tea-planters as still continue to carry on their gardens, now look to leaf, and to leaf alone, for their returns. Pruning has now begun to be generally practised; and in Dehra Dhoon indeed, every plantation has been submitted to the knife. The measure has not however always been either wisely or well carried out. A few remarks therefore upon the facts and principles on which the operation is founded might be of use as guiding to a correct practice, and before going further, it will be necessary to consider briefly the structure of the stems and leaves of plants, and their mode of nourishment and growth.†

The organs of flowering plants may be divided into *vegetative* and *reproductive*. The vegetative organs are those by which the life of the individual is sustained, and by means of which it grows; they consist of root, stem, and leaves. The reproductive organs (consisting of flower, fruit, and seed) are concerned with the continuation of the species by the production of other individuals, and they are supported by the plant for this purpose. It is with the former set that we are now chiefly concerned. The structure of each and all of these parts (however much they may differ from each other in texture and external apearance) is fundamentally the same. Each consists of an agglomeration of vegetable cells. The vegetable cell which is thus the ultimate element of vegetable anatomy, consists typically of a very minute spherical closed sack, with certain fluid and occasionally soiled contents. It is in fact a tiny bladder filled with fluids and solids, the membrane being thin enough to allow of the passage of fluid through it. But although typically spherical in form, cells are rarely so in fact. Some are developed into ducts and cylinders of various sorts, for the transmission of fluids in the stem and leaves; others are lengthened out into spindle-shaped bodies, and made up into small faggots for the formation of wood; many are flattened into bricklike forms for the construction of bark, and into tiles for smoothing off the surfaces of the leaves; while in immense number are used as packing material or padding, and are stuffed in wherever there is a blank to be filled up in the internal structure of leaves. Pith of young plants is also made up chiefly of cells squeezed into a variety of shapes by pressure. But

* These heights do not profess to be exactly correct.

* At present, happily, only a few such exist.

† It has not been thought advisable to introduce more scientific matter than was absolutely necessary: the account that follows of the structure and function of certain parts of plants, must therefore be accepted as only one, which does not pretend to be complete.

modified as they may be in form and function, they all remain essentially cells, and while young, the walls of all have the property of giving passage to fluids and gases. The cells in old wood, however, are exceptions, as their walls having become thickened, and their cavities obliterated, they are nearly, if not entirely, impermeable by fluids.

If the stem or branch of a tea-plant be cut across and examined with the naked eye, the following parts will present themselves. In the middle of the stem, if it be an old one, there will be seen a cylinder of hard wood*; outside this a circle of green young sap-wood; and encircling all, the layer of bark. When examined microscopically, the central cylinder of wood is found to be formed chiefly of spindle-shaped cells laid close together vertically, and with their tapering ends over-lapping. In old wood, as has just been said, these have become incapable of transmitting fluid, and therefore of performing any vital function; and the wood formed of them is useful to the plant merely as a mechanical support. This explains how trees that have become hollow from the decay of the wood in the centres of their stems can continue, nevertheless, to throw out leaves, and to yield flowers and fruit. The structure of the encircling layer of young or sap-wood differs in no way from that of the hard-wood, except that the walls of the spindle-shaped cells of which it is mainly composed, are thin and pervious to fluids, and the cavities of the cells are themselves filled with fluid. In stems of plants that have not attained a sufficient age, no central cylinder of hard-wood will be recognizable. The whole of the woody tissue will in such stems be found to consist of sap-wood, which will however be of greater density towards the centre. When the sap-wood is cut across, a greater or less amount of fluid will at certain seasons exude, and this is the layer which, in the language of gardeners, "bleeds" if cut while the sap is rising. Outside the ring of sap-wood is the bark which is composed of several layers, the inner of them being vascular and affording passage to fluids, the outer mainly protective.

The woody parts of the root of a tea-plant, being in reality merely stems situated underground, will be found to resemble the stem-proper in structure. The real roots consist not of the woody parts which give mere mechanical support, but of tender fibrils which proceed from these. These fibrils are composed of cellular tissue permeable to fluids, and, as will be seen presently, they are the chief means by which the plant collects its food.

The leaf, which is anatomically but a flattened expansion of the branch, and which retains an organic connection with the branch consists of a mass of loosely packed cells confined between two cellular membranes (which form the skin on its upper and lower surfaces) and penetrated by spreading bundles of fibres and vessels—the so-called "veins"—derived from the branch. These loosely packed cells, as well as the vessels of the leaf, are freely permeable by fluids. The root, stem, and leaves of which the above is a rough account, form the organs of a plant's digestion and assimilation, and therefore of its growth. The materials of its food must now be considered, and also the mode in which these materials are taken up and digested.

Plants cannot take in solid food. Whatever they absorb must be offered to them, either as a fluid or as a gas. The gaseous food of plants, in as far as it is absorbed in the state of gas, may be omitted from particular consideration at present. It is in the form of fluid that the great bulk of their food is taken up. This fluid consists of the natural moisture of the soil, and of the various salts of the earth and of manures which that moisture may hold in solution, and is absorbed by the delicate root-fibrils which radiate in all directions in search of it. Collected from the soil by the fibrils, this undigested fluid is conducted to the stem where, avoiding the hard heart wood, it passes into the part described above as the young or sap-wood layer, and, transmitted from cell to cell, passes upwards through the main stem along this layer, enters the corresponding layer in the branches, and finally reaches the flattened expansions of these which we call leaves. This ascending undigested fluid is known as the *crude sap*. Having reached the leaves, and there becoming exposed to the influences of light and heat, this sap parts with a large amount of water by evaporation, and undergoes certain chemical changes. Thus altered in character (and as it were *digested*) by the processes to which it has been submitted in the leaves, &c., the sap is now no longer crude, but has passed into the condition in which it can be directly assimilated as nourishment by the cells of the plant. Up to this point the sap had been transmitted upwards in obedience to certain physical laws, and during the upward passage, probably no nutritive function had been fulfilled by it. Before parting with the fluid which they have thus elaborated, the leaves retain as much of it as they require for their own nourishment and growth, and the remainder they return to the branches and stem, mainly† through the vascular tissues of the inner bark, *i. e.*, the ring immediately outside the cambium. Passing downwards through these vessels as its main channel, the elaborated sap is distributed to all the growing parts of the branches, stem, and roots, and in fact affords to these, as to the leaves, the materials of their nourishment and growth. It is thus clear that the leaves are organs of very great importance in the economy of a plant's life, and indeed the mutual interaction of these and of the roots, its life may be said to consist. The truth of this is well illustrated in the structure of the seed, which, in the class of plants to which tea belongs, contains the rudiments of two leaves and of a root, with sometimes a little store of nourishment in addition. The parent plant supplies these to its offspring to enable it to start in life, and the very first thing that offspring does, when, in the act of germination, it begins life on its own account, is to send the two embryonic leaves upwards, and the embryonic root downwards, and so begin the mutual process above-mentioned, and thus become a living thing.

The evaporation which takes place in the leaves, consequent on the exposure to the air of the crude sap in them, is a potent cause* of the ascent of that sap in the stem, and of its collection by the roots. As long as the leaves remain green and healthy and continue exposed to air and light, so long will the roots go on collecting from the soil, fluid which the young wood of the stem will transmit upwards in a steady stream. The vigour of the one process is accurately proportioned to that of the other. The roots will not long collect, neither will the young wood of the stem transmit fluid for which there is no demand in leaves above. If from any cause the demand made by the leaves should be suddenly reduced, (as it would be by the removal of branches in pruning), the supply of sap which had been collected to meet the previous demand would thus become excessive and the excess would be got rid of either by the discharge known to gardeners as "bleeding," or by the plant making an effort to utilize it by rapidly putting forth new shoots and branches. Suppose, for instance, that a tree in full health and vigour be cut down close to the ground, either of two things may happen; the sap in course of collection by the roots will either simply run to waste on the surface of the cut stem, or a growth of young shoots will spring up round the margin of the stump, or from the underground stem. Shoots originating in this way are known in Forestry as coppice, and the vigour and rapidity of growth shown by many of them, though often surprising, is easily explained when we consider that they are nourished by a root-system calculated for the leaf-system of a tree. If shoots arising in this way be persistently cut down as fast as they appear, and the root-system be thus deprived of all demand for its collections and as it were of all object in life, it will soon decay and die. It is needless to say that, on the other hand, the growth and vigour of the leaves are modified by circumstances affecting the roots, and that any injury to the latter soon tells upon the former.—

To be continued.

* In some trees the hard-wood and sap-wood are of different colours. In Shishum (*Dalbergia Sissoo*) and Khair (*Acacia Catechu*) for example, the former is dark-brown, the latter yellow or whitish.

† The growth of the young wood takes place at its circumference, and the growing layer is known to Botanists as the *Cambium*. This layer is also charged with descending sap.

* An excellent idea of the influence that is exerted on the ascent of the sap in the stem by the evaporation in the leaves is obtained from the results of Dr. Hale's experiments. He found, for instance, that the evaporation from a cabbage of medium size amounted, during twelve hours of a summer day in Britain, to nineteen ounces.

COFFEE.

There is a character in one of the anti-slavery novels who reduced it to a matter of pounds, shillings, and pence, that it was cheaper to exact the utmost amount of work his slaves could do and to replace those who died off by fresh gangs, than to give lighter tasks and thus prolong the existence of his people to the full measure of their days. The case of the Government with reference to the coffee planters of Coorg would seem to be somewhat analogous, and they are anxiously watching for indications at the present time, as to whether Government intend to adopt the former or the latter policy towards them on the question of the Land Tax,—in fact, whether the executive means to enforce the assessment of two rupees per acre which may ruin the European coffee growers, or to lighten the tax and preserve this source of industry and wealth to the province. The tenure upon which planters hold their lands, is given briefly, as follows, in the Manual of Coorg by the Revd. G. Richter:—"From the first to the fourth year the land is rent free from the date of acceptance by the District Officer of the tender for the grant. From the fifth to the ninth year one rupee per acre on the whole area, except a certain proportion of waste grass land. From the tenth and subsequent years two rupees per acre." In addition to this it is enacted by the amended rules that valuable timber in forests already in possession and about to be felled, is to be purchased by the tenant on his paying a royalty upon each tree. The effect of this last grievous impost is to burden the planter with a further payment to Government of ten to twenty rupees per acre, according to the value of the timber, which has to be taken at the rate fixed by the forest conservancy. It may be remarked here that the rule in force till within the last year or two, was much more equitable, the timber lying on newly felled land being put up to auction by

Government and sold to the highest bidder, and it is earnestly desired by the holders of land, that this mode may be readopted. It will happen that in the year 1872, a very large majority of the European planters will become liable for the major tax of two rupees per acre on the cultivated estates, and on the standing jungle also, but the unanimous feeling is that coffee growers cannot afford to pay it, and that if the collection be pressed many a good vessel tempest-tossed by the stress of hard times and bad seasons may go down. The Planters' Association has, we learn, discussed the subject fully; various propositions have been mooted and petitions have been sent up by them to Government embodying the views and feelings of the community concerned. As yet, we know not whether their burden is to be lightened. Possibly Government may consider that those planters who may be driven out by the increased tax can be replaced by others willing to pay it. We venture to say that it will not be so easy to replace the present body by new men, as the American slave-owner found he could do by buying new slaves to fill up the places of his gangs who died off from over work and want of food. It is a notorious fact that there have been scarcely any new settlers in Coorg during the past three years; that on the contrary several men who came out to make coffee-planting their profession, have left the district disappointed and disgusted. Perhaps Government imagine it will be possible to induce the Coorgs and native growers of coffee to take over all estates and properties abandoned by Europeans when the heavier assessment comes into operation. We submit, however, that this is not very likely to come to pass, because the Coorgs and Jamma landholders obtain pieces of land favourable for coffee cultivation free and for nothing, taken in with their paddy-fields held on Jamma tenure. But even if the Coorgs could be persuaded to buy up such abandoned coffee properties, it would not pay Government in the long run, for the native coffee growers do not use one tithe of the labour employed by the Europeans, nor would it be difficult to show that the land revenue, exclusive of coffee lands, has been greatest at the time that British capital was most freely invested. Quoting again from Richter's Manual of Coorg, we find that in 1858-59 the land revenue, exclusive of cardamoms and coffee, was Rs. 1,45,940. In 1864-65 it had risen to Rs. 1,67,803, and how can this increase be accounted for? Simply for the reason that the Coorgs had invested in paddy lands the money they obtained for their jungles between those dates, from intending coffee planters, that the grain cultivators sold their produce at enhanced rates, owing to the influx of coolies from the Mysore and Bangalore districts to the coffee estates, and that to almost every native in Coorg accrued some benefit from the great amount of capital invested by Europeans. In 1869-70 we find the above land revenue had fallen to rupees 1,60,111. And what had happened to the coffee planters in the meantime? We need hardly remind residents in the Madras Presidency of the shock the coffee industry in Coorg has sustained of late years, how the great Bombay crisis made money less plentiful to many unfortunate and enterprising planters, and how several bad and dry seasons, with borer, bug, and other evils, caused a succession of short crops. But it is still believed among planters that a coffee estate, carefully opened, may be made a source of profit, though the splendid visions of 15 cwts per acre all round that obtained in 1864 have passed away. It has been adduced by some that the planters brought the two rupees per acre land-tax upon themselves, that as they petitioned Government for the present tenure and got it they ought to abide by it. And when did they do this? At the very time that crops from coffee estates were anticipated to be from 15 to 16 cwts per acre, or at least five times the existing average, at a time when men holding Government appointments worth over Rs. 12,000 per annum were throwing them up to go into coffee. And is a tax based on a delusion to last for ever? Let us investigate the matter more closely and see what the profits from estates may be estimated at and what percentage of net profits at two rupees per acre land-tax will absorb. We assume then that an investor purchases 500 acres of forest costing him ten rupees to fifteen rupees per acre, which he gets free for two or three years at a nominal tax fixed on the old cardamum puttah tenure. He has therefore not been so fortunate as to obtain his land free of tax for four years, but has to pay one rupee per acre as soon as his puttah expires, say the second or third year after he purchased. The timber had gradually to be bought also according to the acreage he felled; so that taking all things together, he has been paying more than the equivalent of one rupee per acre land-tax per annum from the time he started. His cardamum puttah having run out, he now pays rupees 500 per annum for five years and afterwards at the rate of two rupees per acre or rupees 1,000 per annum. The planter thus finds he has been able to open 250 acres during the first five years, that he has 100 acres of fair land left, but that the remaining 150 acres are worthless for coffee cultivation being chiefly tops of hills exposed to the South-West monsoon. We will not discuss the percentage of profits he has been paying in the shape of tax during the time his estate was but partially in bearing,—and it often happens there are no profits at all, but the tax has to be paid nevertheless. We will pass on to the time when the 250 acres are in bearing and produce an annual crop of thirty to thirty-five tons, valued at 50 per ton or Rs. 15,000 to Rs. 17,500. The yearly working expenses to keep this acreage in good order may be put down at Rs. 10,000 to Rs. 11,000 without cost of superintendence. Reckon interest on capital sunk at 5 per cent. on Rs. 35,000:—

Trees 30 tons at Rs. 500 ...	Rs.	15,000
Working expenses on 30 tons ...	10,000	
Interest on Rs. 35,000 at 5 per cent. ...	1,500	
		11,500
Net profit without land-tax ...		3,500
Land tax at 2 Rupees per annum ...		1,000
Net profit ...		2,500
Or 35 tons at Rs. 500 — ...		17,500
Working expenses on 35 tons ...	11,000	
Interest on 35,000, Rs. ...	1,500	
		12,500
Net profit without tax ...		5,000
Land tax at 2 Rupees per annum ...		1,000
Net profit ...		4,000

In the first case the land-tax is equal to 28½ per cent. of net profits, in the second case to 20 per cent. It will thus be seen that, supposing the above data to be correct, a two rupee per acre land-tax is equal to from 20 to 28½ per cent. of the net profits from the estate. In fact it appears that Government is virtually a partner in a huge business in Coorg with at least 20 per cent. of net profits guaranteed as long as the industry lasts. Or to look at it from another light. A two rupee per annum land-tax is equal to an income-tax of from four shillings to six shillings in the pound. In addition to this the planter is liable for his share of indirect taxation, Municipal license, or any other tax that the Government of the day may choose to levy. It may be urged that a piece of bamboo land pays better than a block of forest; but if the profits be greater they are more precarious, suffering as they do from borer. The estate may not last so long and the expenses of cultivation are heavier than in forest. If the south-west aspect be not dreaded, swamps and bamboo scrub represent as large a proportion of land unsuited for coffee as in the instance just given, and if bamboo land costs less to begin with, the timber costs more than it does in forest. Indeed, it would not be difficult to show two estates, taking forest and bamboo together, that are making smaller profits for every one put forward as giving larger net returns than in the case we have cited above. There can be no doubt that the true test is to take the average of what the whole of the plantations in Coorg are doing, and we feel convinced we have shown net profits that are over rather than under such average. It is possible that planters of some districts are much better off. Though we could point out numbers of estates that do not pay at all we have purposely given as an example one that is profitable, as the figures show that taken at the best, a 2 rupee per cent. land-tax all round exceeds the rate that any Government, anxious for the welfare and prosperity of European settlers, would care to levy, and we contend that it is obviously to the interests of the executive to keep the land-tax at present at such a level that it may not exceed one rupee per acre on the entire holdings. In the case we have given, if the uncultivated portion of the land, most of which has been classed as worthless, had been allowed to run free of assessment, the result would have been a great boon to the planter; it would have diminished his tax by one-half. Practically it is found that with the one rupee tax in force, although the condition of planters is anything but thriving, existence is possible and daily bread procurable: nor can it be doubted that the investing of English capital is an advantage to Government, particularly as the bulk of the gross returns from coffee estates are given back to the country in the shape of pay for the labour employed, and it would be interesting to know the exact amount of increased wealth that has been collected in small sums of late years by the natives of this country in general, and by the Mysore coolies in particular. Reckoning that there are 100 estates owned by Europeans with an average expenditure in labour of rupees 8,000, the result would be that over fifteen lakhs of rupees are yearly paid away for the hire of coolies and maistries. If ever the coffee industry required encouragement, it is now, and if it ever behoved Government to have a regard for the planters' interests, it is at the present time, and we certainly trust the Government of India will be wise enough to adopt a statesmanlike and liberal policy with regard to the question of land-tax on coffee estates and jungles, and will strenuously avoid imitating the example of the old lady in the fairy tale who, in her hasty greed for the immediate increase of her revenue, killed her goose that laid the golden eggs.—*Athenæum and Daily News.*

CONCESSIONS TO WYNAAD AND NEILGHERRY PLANTERS.

The following is an extract from the Proceedings of the Madras Board of Revenue:—

"In their Proceedings of the 18th May 1869, No. 3,380, the Board, in reporting on a memorial from Wynaad planters, recommended that all land should be held free for the first two years, that one rupee an acre should be charged in the third year on planted land, and that the full tax of Rs. 2 an acre should be charged in the fourth and subsequent years on all land then planted

out, that unfelled forest land should be charged one rupee an acre, and that grass-land included in forest blocks not planted should be held tax-free. The Government recognized the depressed state of planting interests, and expressed themselves as disposed at any rate to let the Wynaad planters hold their land-tax free for three years; but before sanctioning any change in the rules called for, reports from the Commissioners of the Nilgiris and the Collector of Salem, on the ground that any change in the Wynaad rules would necessarily be applicable also to the Nilgiri and Shevaroy Hills. The Board submit, however, that the circumstances of these three localities are so different as to necessitate different treatment.

"The Collector of Salem reports that no change whatever is required on the Shevaroys. He states that the price paid for the land is always very small, that all preliminary expenses, except the purchase money, are paid by a crop in the fourth year, and that money sunk in well-worked coffee estates yields a profit of 25 per cent. per annum. He points out that the price of land is higher in the Wynaad, the cost of labour greater, and the land-tax twice as heavy. The Board concur with the Collector in considering that no change need be made in the rules for the sale of waste lands on the Shevaroys.

"The Commissioner of the Nilgiris sent in his report on the 26th October 1869, No. 149, and submitted the replies of twenty-two planters whom he had consulted; sixteen of twenty-two objected to the system of selling by auction land applied for by planters, but the Commissioner did not think that facts justified the complaint. He recommended that no quit-rent should be charged till the fourth year of possession, that a corresponding indulgence should be given to all who had already purchased land under the rules of 1863, that the concession should be saddled with the condition, that a third of the estate should be planted by the end of the fourth year, and that permanent grazing puttahs should be issued to planters purchasing estates from Government at the rate of 4 annas an acre for an extent of grass-land equal to half the area of their estates. The Board considered it clear that the depression of planting interests on the hills was much greater than in the Wynaad, and was so serious as to require that the existing system of selling land and levying revenue thereon should be carefully considered. Planters appeared to be almost unanimous against auction sales, because they enabled others to take advantage of the care and ability of any planter who, after much preliminary labour, had succeeded in finding a fit site for an estate. There was reason, moreover, to think that sale by public auction did not secure the interests of Government. On the whole, the Board were disposed to think that the system had not worked well, and that a modification of the durkhast rules might be introduced, a fixed price being charged per acre. With regard to the revenue to be levied on the land, they considered it best that the land should be held tax-free for three years, that half assessment should be charged in the fourth year, three-fourths in the fifth, and the whole in the sixth, without reference to the extent under cultivation. To avoid placing future estate holders on a most favourable footing than the owners of estates in existence, the Board thought it might be desirable to raise the permanent assessment slightly in cases where land is granted on these favourable terms.

"Before submitting these views to Government, the Board called on the Commissioner to give his opinion with regard to them, and his letter of the 7th May contains his reply. Mr. Brooks is strongly in favour of sale by auction. He considers that no other method could dispose fairly of the varied interests which may exist in any piece of land which an applicant under the Waste Land Rules desires to obtain, and he cites figures showing that in the majority of cases there is no competition at all, and that it is keen only in very few cases, involving but a small extent of land. The same figures show that the interests of Government are not protected by auction sales. The three largest lots comprise about 50 acres, for the greater part of which the price realized was only an anna an acre. There can be no doubt that Government would be a gainer if a fixed rate was charged per acre.

"On the whole, though the necessity of sale by auction has not been proved, though it is unpopular with those most interested in the subject, and though it must often fail to protect either the interests of the would-be purchasers or of Government, the majority of the Board see the force of the practical difficulties stated by the Commissioner, and, regarding the system as finally determined by the orders of the Secretary of State, resolves not to pursue the discussion further.

"With regard to the land-tax, Mr. Brooks argues against the increase of assessment with which the Board proposed to compensate for a more favourable cowle, and urges that whatever terms are granted to future applicants, it is absolutely necessary to put existing planters in the same position, giving them credit for their assessment hereafter, until they have enjoyed the same period of tenure as would be purchased under the changed rules by the amount of their past payments. The Board concur with the Commissioner as to the inexpediency of raising the assessment, and as to the way in which existing proprietors should be placed on equal terms with future purchasers of land, but they prefer the cowle proposed by them to that advocated by Mr. Brooks, which, in their opinion, does not give a sufficient measure of relief. The Board accordingly resolve to recommend the land purchased under the Waste Land Rules on the Nilgiris be held tax-free for three years, and that half assessment be charged in the fourth year, three quarters in the fifth, and the whole in and from the sixth.

"In the more favoured tracts of the Wynaad, the Board think it will be sufficient if Government allow the land to be held tax-free until the close of the fourth year, as proposed in Government Order, dated 7th September 1869, No. 2526. Both on the Nilgiris and in the Wynaad, owners of existing estates should be placed in the same position as future applicants, credit being given them to the requisite amount for assessment as it falls due.

"In their Order of the 30th June 1870, No. 982, Government in disposing of Proceedings, relating to a memorial from the planters of Wynaad, direct the Board to recur to the subject when submitting this reply to Government Order, dated 7th September 1869, No. 2526, and to ascertain in the meantime the views of the Collector of Salem and the Commissioner of the Nilgiris.

"No answer has yet been received from Salem, and the recent death of the Collector makes it probable that some time must yet elapse before it can be submitted. The late Mr. Pochin's account of the condition of planters on the Shevaroys, however, makes it unlikely that any change in the Waste Land Rules is necessary there. The complaints of the Wynaad planters with regard to surveys, &c., are met to a certain extent by Government Order, dated 10th August 1870, No. 1225.

"With regard to the rule relating to the frontage of blocks of land, the Board think it will be enough if the proviso which Mr. Brooks states to be in force in Burmah and the Lower Provinces of Bengal is introduced, namely, that for special reasons the restriction may be relaxed by the Board of Revenue. The First Member of the Board dissents in part from these proceedings, and has recorded a minute on the subject."

The following is the Order of Government thereon, of the 22nd September:—

"The foregoing papers relate to the present depressed condition of the planting interests in the Wynaad and on the Nilgiris, and to the expediency of affording them some relief by a modification of the terms on which land for planting purposes is now procurable. It appears that no change in the rules for the acquisition of land on the Shevaroy Hills is needed. The late Collector reported that all the preliminary expenses connected with coffee estates, except the purchase money, are paid by the sale of the crop in the fourth year, and that capital invested in a well-worked estate will give a return of 25 per cent. per annum. The interests involved on the Shevaroys are, however, comparatively insignificant, and the condition of the plantations on the Nilgiris and in the Wynaad is certainly very different; but the Government are by no means of opinion that the present depression can, in any way be ascribed to the operation of the Waste Land Rules. As observed by the late Collector of Malabar and the Commissioner of the Nilgiris, it is probably owing to other causes, among which may be mentioned the increase in the price of labour, a succession of bad seasons, the recent commercial crisis in Bombay and England, the ravages of the borer, the insufficiency of the capital possessed by the planters for their operations, the high rate of interest paid for borrowed money, &c.

"At the same time the Government fully recognize the political and other incidental advantages to be derived from an influx of Europeans and European capital into India, and they would gladly give every reasonable encouragement to this movement. It is true that the grant of land by Government, entirely free of tax, would not make the cultivation of coffee, tea, or cinchona, a profitable speculation under certain circumstances; but any modification of the existing rules which would render them more favourable to the planter could not fail, in some degree, to assist him, and it is impossible to deny that at present the large majority of the existing estates are in a languishing condition, and that their proprietors have been brought to the verge of ruin.

"The Right Honorable the Governor-in-Council having given his most careful consideration to the several proposals made in the papers above recorded, and having also personally discussed the questions under consideration with deputations representing the planting interests, both of the Nilgiris and a portion of the Wynaad, has deemed it advisable to sanction the following relaxations, by which it is hoped some relief may be afforded to the planting interest:—

"In the Nilgiris no quit-rent will be exacted on forest land taken up for the purpose of planting until the sixth year, that is, the planter will hold his land free of assessment for five complete years, the climate being so severe that a remunerative crop is rarely obtained until after the lapse of that period. In the Wynaad, where the coffee plant comes more rapidly to maturity, forest land will be held free of assessment for three complete years. The assessment will be taken for the fourth year. The assessment prescribed for forest land at present will not be altered. It will remain for the Nilgiris and the Wynaad alike, fixed at Rs. 2 per acre; but the Conservator of Forests will be consulted previous to the sale of any such forest land. With the view of encouraging the multiplication of cattle, and the abundant application of manure, which has proved to be so essential to the sustained productiveness of plantations, the rent of grazing land is reduced from 1 rupee to 8 annas. The rent of grazing land will be exacted from the date of appropriation."

"In making the foregoing concessions to the planting interests, it has been felt that, if they are to have any useful effect, they should be declared sufficiently prospective. There are some areas but recently taken up and partially opened, there are others on which a number of contracts are due, and which will unfortunately be abandoned unless remission be made; there are others fully cultivated and on which there are no arrears, but which are worked without profit or by a yearly sacrifice of capital; all these it is proposed to submit to the same advantages. In the rare cases of estates which are in full production, which have no arrears, and which are cultivated with undoubted profit to the proprietor, it is still deemed advisable that the modified regulations should be applied. If such estates were placed in an exceptional position, there can be little doubt that disputes and dissatisfaction would arise, and that the refusal of the concession would be regarded in the obnoxious light of a special tax imposed upon superior skill, industry, and management. The benefit conferred by Government is applicable to all alike. Land taken up previous to the introduction of the Waste Land Rules will, of course, remain unaffected by the new regulations.

"The alteration of the frontage rule, to the extent of permitting a relaxation of the restrictions in special cases, by the Board of Revenue, as proposed, is sanctioned. These proceedings will be reported for information of the Secretary of State as was done in the case of the original rules."

THE OCHTERLONY VALLEY.

NEILGHERRY HILLS.

(From an occasional Correspondent.)

In compliance with a cordial invitation of some friends to join them in an excursion to the above-named and far-famed locality, and being desirous of revisiting the splendid coffee estates there, which I had not seen for ten or twelve years, and which during that period have been so vastly extended and improved, I gladly availed myself of the opportunity thus offered, so, after the necessary arrangements and equipments had been prepared, we started early on a fine morning last week, (strange to say it *was* really fine), with the sun shining brightly behind us, and a breeze blowing fresh and bracing over the broad expanse of woodland and wold that we had to traverse on our journey to our destination. We made use of both the old and new roads as they intersected each other at various points, but held more to the latter on account of its good bridges over the many streams: but now and again for a short cut, cantering across the "verdant turf" which at this time is indeed a beautiful green carpet, decked with a profusion of lovely wild flowers, conspicuous amongst which are a variety of balsams, pedicularis, salop, gentian, taraxacum, and an innumerable host of others, of all hues and forms, extending for miles, which conjured up visions of the prairies of the far far west; the effect of the landscape was complete to perfection whenever the clear and sparkling waters of the Pykara river, or other lesser streams, formed a part of it. The roads were rather heavy in consequence of the late rains, and we could not help observing the absence of milestones or posts along it for the convenience and information of travellers, —a want which has long been felt and complained of and should be attended to without further delay, as it is the only high road on the hills without them. After a pleasant ride of about three hours we arrived at the bungalow of the Neddiwuttum cinchona plantations, where we were heartily welcomed and entertained by the Superintendent, Mr. Rowson. These estates are now so well known, and the magnificent scenery by which they are surrounded, that a further description of them (even were I able to express their grandeur) is needless here. The trees of the upper and oldest plantations are just at this season looking their best; *C. succirubra* holds its own for size and luxuriance of foliage, while the *C. condaminea* still adheres to its stunted and shrubby habit, given more to seed-bearing than growth of wood. The average height of the former is now twenty feet, and the girth at one foot from the ground, twenty-seven inches. Experiments are still being carried on with the mossing process, and with the barks of different ages produced thereby; but it is not yet resolved as to the time of the year, the method, and the quantity of bark to be taken off each tree. If I am rightly informed, the cause of the great discrepancy between the alleged number of trees planted and the acreage as per Government survey, is easily accounted for, as the estates appear to have been surveyed by triangulation, from point to point, across valleys; the area thus obtained in the plans, would obviously be far short of the actual surface planted, the acreage of which could only be ascertained by traversing the boundaries with all their details up and down hill with chain and theodolite or pelometic compass, in the usual manner of land surveying, and thus the number of trees and acres be calculated with accuracy and ease. It seems, however, that an order has been passed for taking a census of or counting and marking every tree and vacancy on each plantation. I do not envy the enumerator his task, who with paint-pot and brush in hand will have to travel some hundreds of miles ere his labours are finished. It has been suggested that a piece of red tape tied round each tree would be an improvement upon the paint-pot, as being easier of application and more appropriate and symbolical of the powers that be: the results of the undertaking, when known, will be curious and instructive.

Having rested awhile and refreshed both man and beast, we resumed our ride, and were soon passing the large and well-built house situated at the head of the ghaut commanding a splendid view, and occupied by Mr. Wapshare, the Managing Director of all the estates in the valley. The descent commences here (elevation about 6,700 feet) and continues at an easy gradient, intended for carts, by a well-traced road (as yet far from being finished) to the "Guynd" estate, the largest and most valuable of the properties, the mean elevation of which is estimated at about 3,400 feet above sea-level. The scenery from different points of this ghaut is truly grand, and the mind soon becomes wrapt in admiration of it; as we descended clouds and mist rolled slowly up beneath us, and though partially obscuring the view, heightened its effect,—the far off peaks seemed more distant, the immediate crags higher and more towering, while all below an unfathomable space,—reality lost in a sea of gloom and vast profundity. We were aroused from our musings, by the noise of falling water, which a sharp turn of the road opened to our view on the left. This is one of the prettiest cascades to be seen on the hills, as it comes leaping and falling in snowy foam over the rugged boulders that form its rocky bed in densely wooded gorge through which it runs, soon lost to sight down a deep chasm on our right, to re-appear in the open coffee land, where it is utilized by the different estates to turn their huge water-wheels connected with the pulpers and other machinery, after which it empties itself into the Moyar, and so on to the Bowany. As we descend we become sensible of a warmer temperature. Vegetation is assuming a luxuriant and tropical form. Beautiful and curious parasitic and herbaceous plants are now seen on every side, orchids, mosses, and dewy ferns arching their graceful and feathery fronds in thousands from every rock and tree, elegant creepers hanging in festoons, and covering with their wild fantastic drapery the trunks of enormous forest trees, venerable giants of many hundreds years: these are some of the principal features nature puts on here. The first cultivation to be seen on the way down, are the tea and cinchona estates, with their picturesque buildings, belonging to Mr. Rhodes; to all appearance they seem to be flourishing. We next pass through a portion of the Balmadies coffee estate, also belonging to Mr. R., after which we enter the "Guynd," and by a gradual and winding road we reach the Superintendent's bungalow, where we remained during our short stay, and in which we were most kindly and hospitably entertained by Mr. C. Dawson and his good wife. My impressions whilst riding or strolling through the different fields of coffee on this splendid property were those of admiration at the vigour and luxurious growth of the tree, the dark glossy green of its leaves, and the uniform healthy appearance of the whole, but was much struck and surprised at seeing so little fruit. I believe the crop on the trees will not exceed 5 cwt. an acre all round, even if it reaches that low figure; and this estimate was endorsed and confirmed by my companion, a planter of 15 years' experience. This small yield seems entirely attributable to the system of pruning now in vogue in the district, by which the very best parts of the tree are cut away; this is followed by what is elsewhere properly termed "handling" but here the knife is again used, and melancholy indeed is the effect of it upon the condition of the tree. It is a matter for very grave consideration how much this system of pruning has to do with the light crops. It is undeniable that *judicious* pruning has a wonderful and surprising effect on the bearing capabilities of the coffee tree, but climate, soil, and the seasons, exercise a greater influence in producing crop, and I venture to affirm, that, if less wood were taken from the trees and more done in the way of cultivation, *i. e.*, trenching, terracing, renovating pits, &c., that the soil of the "Guynd," with such stamina that it possesses, together with the natural advantages of its climate, would yield an average of ten cwt. an acre for the next quarter of a century, without exhaustion, and with double profits to its owners. The buildings on these properties are worth a long ride, to those professionally interested, to see; good substantial edifices they are, of good material too—bench, bricks, and chunam, roofed with iron, shingles, and tiles, with the usual appurtenances for economising labour, such as water-wheels and improved machinery. Coffee shoots of round galvanized iron for sending down the berry picked from distant fields have also been put up on the "Guynd." The barbacues here consist of wooden frames covered with coir matting resting on brick pillars; all are in a busy state of preparation for crop, which is expected to be in full swing by middle of next month. The comfort and size of the Superin-

tendent's bungalows are also worthy of notice; the one in which we sojourned with its papered walls and other little luxuries, its neat and well-kept flower and fruit garden, might well serve as a model for cleanliness and refinement. The discipline and order characterising the whole system of the working in all details, and the efficient staff of assistants, &c., who so ably carry it out, is most exemplary, and must be a source of much satisfaction and happiness to the gentleman who rules and directs; nothing seems wanting, except a person, a library, and club, to complete the little colony, where so much kindly intercourse and harmony prevail.

Our visit terminated on the third morning, when we took leave of our kind friends and commenced our toilsome ascent homewards, amidst rain and fog; and after a cold, wet, and weary ride of nearly five hours, we arrived at the Pykara bungalow, where we found a good breakfast prepared for us (I never shall forget that breakfast), which with its after-cheroot, amply compensated for the fatigues we had undergone, and produced that calm and tranquil state when "every sense is joy" alas! too soon to be dispelled by the sight of Ooty, with its dark and sombre-looking Australian trees, hideous architecture, long faces, its bickerings, prejudices, rivalries. * * *

Nilgiris, Sept. 1871. G.

OFFICIAL COFFEE DEALERS IN KANDY.

DEAR SIR,—May I ask, through the medium of your Journal, why it is that the Government allow some of their clerks to trade in coffee, seeing that the Civil Servants in Government employ are forbidden to engage in trade. I allude to one of the clerks in a Kandy office now engaged in the trade, and therefore interfering with us poor traders, who are trying to make a living. I hope the authorities will put a stop to this injustice being done to us.—I am, Sir, yours obediently,

Kandy, 1st Nov. 1871. A NATIVE COFFEE DEALER.

COFFEE LEAF DISEASE, NORTH OF KANDY.

DEAR SIR,—I have read your editorial and the letters from various writers on the leaf disease with a good deal of interest, but did not for one moment fancy the fates were going to give me a taste of it, but we never know what is in store for us. Drought has been assigned as the cause of it; but I think that is a mistake. After the continued and heavy rains in the latter part of July, and the showers had here in and all through August, and with fine mornings, but generally speaking, cloudy afternoons in September, I hardly think anyone will say we are suffering from drought. On or about 21st September, I noticed the trees were looking a little yellow in the leaf, and attributed it to the crop in those parts, but in less than no time it spread, and parts of the estate bearing a little were just as bad, and within ten days I had 70 acres of coffee attacked with the leaf disease. There is no need my describing it, for it is well enough known, but it was worse than ever on the 4th instant: the next ten days were fine and very hot. This brings us to the 14th, and I noticed all the attacked leaves drop off during this period, and now there is not a sign of it on this estate. Since the 4th it has rained daily, and the estate is making fresh leaves fast. And now, if you will allow me, I would ask Mr. Thwaites, through your agency, is it not probable, or more than probable, that it is caused by the extensive *use of* artificial *manure, and especially by bone dust.* The fields manured with this caught it first, and suffered most, and from this coffee it spread; part of the estate did not catch it at all. I may just add the nearest coffee estate is a half mile off as the crow flies, and that is free from the disease. In Pusilava I heard of fields knocked to sticks, and that on an estate that is highly manured, I believe. Managers there might inform you, if asked, whether the parts manured with artificial manure did not suffer first and most. I remain, yours truly.

"NE FESTINA LOQUI."

Central Provinces, 25th October 1871.

THE COFFEE LEAF DISEASE.

DEAR SIR,—The thanks of those whose estates are suffering from the ravages of the coffee leaf disease are due to you for calling attention to the subject, and inviting discussion as to its origin and to what means may be discovered of repelling its inroads. It appears from your remarks that the theory has been advanced that it shows itself, after a protracted drought when the bushes are consequently in too weak a state to resist its attacks. This is too important a point to be finally settled to permit me to keep back from you my own experience, which teaches me this is not necessarily the case. Few districts, from what I can learn, have, this season, suffered more from the evil than that of Nilambe, and yet it has not for the last twelve years been visited with so wet a South-West monsoon. It first began seriously to feel the effects of the fungus in July, a particularly rainy month, and has generally been its victim ever since. The trees which were first affected have been for some time recovering, and were not checked in their improvement by the few weeks of dry weather, just ended by the late heavy rains, and, although not quite free from it, promise to regain the former luxuriant growth. Indeed, when the enemy invaded us, we all here, attributed our misfortune to the almost unceasing rain we had for some time been having. Again, as regards the injury incurred by the tree; from the tendency it has to throw out new wood, even when its aspect is most sickly, and from the rapid growth of the leaves and the young shoots as soon as it is only partially relieved from the plague, there is good reason to conclude that it has not been vitally affected, that its distress is but temporary, and that, although in its year of suffering it will give a reduced crop, or none at all, even, it will yet, by yielding many a profitable harvest, respond to liberal and judicious cultivation.—Yours truly,

Nilambe, 20th October. NIL DESPERANDUM.

THE PLANTER'S ASSOCIATION:—THE COFFEE-LEAF DISEASE.

DEAR SIR,—From the frequent applications made to me for information respecting the coffee-leaf disease now prevailing on so many of the estates, I cannot but believe that the following observations may prove of some interest to many of the members of the Planters' Association. The progress of this disease I have been watching with no little anxiety, and the accounts I receive of it are very conflicting. Some planters are of opinion that the higher and the lower estates are sufferers to an equal degree, while others think that the higher estates are not so much injured by this disease as the lower ones. On some estates it is believed that the disease, after having shown itself in a very pronounced manner, has now disappeared to such an extent as to cause little alarm. On other estates which have suffered much from this pest, present appearances do not favour such a hopeful view of the matter. I have heard of trees being killed by the disease in very hot localities. Estates which have never had any manure applied to them have suffered severely. Manuring *per se* could never give origin to the disease, though manure might be the vehicle of its introduction to an estate. The disease is not a mere degeneration of the tissues of the coffee tree, but it is a well-marked fungus, propagating itself by its spores, just as the higher plants do by their seeds. This fungus possesses a distinct individuality, and an independent growth of its own, deriving, however, its sustenance from the nutrient juices of the coffee tree, and making its presence visible to us only when its minute orange-coloured spores are emergent on the underside of the coffee leaves. By means of its innumerable spores, this fungus is widely propagated in a very short period, for these spores are light enough to be conveyed long distances by the wind; and there is little doubt that even a single spore, when brought into contact with one of the tender rootlets of a coffee tree, is capable of infecting that tree with the disease. Under these circumstances it must be seen how difficult it is to suggest any course of procedure likely to avail for stopping the progress of this pest, and having had no previous experience of such a visitation as the present one, we have nothing on which to found a probable conjecture as to how long the disease is likely to prevail. Certain atmospheric conditions may possibly prove to be favourable to the development of this fungus, whilst the same conditions may favour the growth of the coffee tree, and thus enable the latter to gain the position of not being seriously affected by the presence of the fungus, or even to throw it off altogether. Another hope of mitigation of the evil may rest upon the fungus finding an enemy sufficiently numerous to check its propagation by destroying its spores as fast as they are produced; and this is not an impossible contingency, as these spores are found to be fed upon by the maggots or larvæ of a small species of fly. From what source the coffee became first infected with this troublesome disease is at present unknown. It may, however, be reasonably surmised that this particular fungus affects one or more of our indigenous plants, and that it has thence found its way into the the cultivated coffee, to increase and multiply in so wide an area of suitable pabulum as the estates afford it. In conclusion I would venture to remark that, when planting operations are being carried on, the highly infectious nature of this disease should be constantly borne in mind, and that particular care should be taken in the selection of healthy nursery plants for putting out, and of seed for sowing in nuseries.—Yours truly, G. H. K. THWAITES.

THE OUVAH COFFEE DISTRICT.

DEAR SIR,—In your issue of the 25th September appeared—"*Notes by a Planter on a trip through Ouvah.*" The writer, signing himself, "*Eye Glass,*" (and short-sighted I presume), whose impertinence is only equalled by his untruthfulness, whose utter want of modesty seems excelled only by his ignorance, has made such a number of false statements calculated to impress readers at a distance (and who may be interested in Ouvah) unfavourably, that I deem it necessary to contradict them. "*Lies travel apace*" said the Persian sage *Khida.* There was no printing in his days, but now they go much faster, so I beg you will have the goodness to publish this contradiction as early as possible to Eye Glass's letter. He commences by stating that he can hardly

say whether he was pleased or disappointed with Ouvah, a matter perfectly immaterial, I should suppose, to the general public. After approving the Ouvah coffee climate and elevation, here its praises end, he says, and he goes on to state that Badulla is "fusty," the cultivation peculiar, the pruning remarkable; it would be advisable for those interested in it to send up a few pruning knives by way of trial; pruning and hat-pegging are synonymous terms; Badulla planters are great believers in mammoty weeding, and stick to it most religiously. The men of Ouvah have doubtless come to the same conclusion as Mr. Hawkes, that rain adds to the soil. There is also another dodge; a few of the Badulla planters do not believe in the application of pulp, and much prefer spouting it to the nearest ravine, there to await a heavy shower to carry it out of sight, and so on.

Finding the road impassible in his progress to Madooloseema. *Eye Glass* tries a passage through the coffee and discovers a drain, and finds it satisfactory to know that the planters of Madooloseema differed from their brothers in Badulla, and believed that wash did not add to the soil. What with beer barrels and drains, he found it impossible to penetrate further into Madooloseema. However, I will leave the planters there to deal with their would-be visitor and his account of their district, which *he had not seen*, and the obstructed state of their road, &c., having little doubt but that they perfectly understand how to treat him.

To return to his statement, regarding Badulla planters, I have simply to say that they are all more or less false, some perfectly so.

Firstly, pruning has been done for the last 23 years in Badulla, and hat-pegging was never done except by planters brought in from the Kandy side.

Mammoty weeding is not believed in, though it has of course to be done on fields in grass or hillocks, otherwise hand or scraper weeding is the rule.

Pulp manuring has been done for over 20 years, also cattle manuring and artificial manures have been used ever since they have been available.

Draining has been practised for fully 20 years, and several estates are most elaborately drained, and that on the best possible system of gradual delivery, the drain increasing in steepness as it approaches its delivery point. As to the reading, no *Eye Glass* is requisite to shew that the majority of the estates are very well roaded. My object, though is not to extol Ouvah, but simply to shew that the writer of the letter has made false statements. He says in addition, "There are many other peculiarities in the Ouvah "system of cultivation which are quite beyond me, and which "I venture to say will in course of time undergo a change." Their being quite beyond him is likely enough, but as to these peculiarities, as he terms them, undergoing a change, he is utterly mistaken, they depend entirely on the growth, blossoming, and cropping of the Ouvah coffee, which is quite different from that of any other district in the island, except perhaps Dimbulla, and which involves a description of cultivation, totally unlike that practised on the other side of the country, which planters therefrom discover after a short residence here.

Eye Glass goes on to state that "the great drawback is want of "communication with Kandy; let Sir Hercules Robinson, in the "interest of civilization connect Badulla with Kandy, and the "former would be a different place to what it is."

These are gross impertinences. What fettered and restricted Ouvah from the very first was its connection with the west side of the island, could that side have been split off at Nuwera Eliya by an earthquake, and towed over to the African coast, Ouvah would have gone ahead. As it was, all our produce had to take its chance round the island by sea, or to trail the whole way over the central ridge, to be sucked into the Maelstrom at Colombo. Could we have shipped direct from the eastern *mala-borde*, nothing would have equalled Ouvah, as we produced our coffee on the estates for as low as 12*s.* per cwt, we had rice always at 5*s.* to 6*s.* a bushel, transport of coffee to Hambantotte or Batticaloa, ranged from 1*s.* to 1*s.* 6*d.* per bushel, and we had ample labour at a rate of pay now unheard-of. An occasional visit from a respectable merchant (not a sucking planter in training for a visiting Agent or a Colombo quill-driver on the loose) enlightened us as to all we cared to hear about. Connection with the western side has been an accursed hindrance to us; to it we owe the being taxed for years in export duty for a railway, which is of so little use to us, that we are paying the same cart-hire as before it was made. We were plundered again by the Immigration Commission Scheme, a simple case of downright robbery committed at the instigation of the Planters' Association of the day, in fine, we have never received a fraction, but have invariably been made to pay for the benefit of the western side, for the advantage of some of its effete used-up, manure subsisting, poonac and bone-dust devouring districts. Learning from Kandy planters! Heaven preserve us, the only man I ever saw attempt to plumb a post by getting up and squinting down it was a Kandy planter! Another tried to trace a water-course uphill, and another I saw spend the best part of a day, trying to take a trace of 1 in 10 *over a dead flat*; both these planters subsequently joined commercial firms, connected with coffee, one as principal, the other as junior partner. The only people I ever saw commence to plaster a barbecue on the lowest side first, and plaster the retaining walls of a built-up barbecue, leaving the top open and unplastered to the monsoon rains, were Kandy planters. The only planters I ever saw collect the wash by a drain on the inner side of the roads, and then shoot it off into the coffee by cross drains, were Kandy men, who are the only people too I ever saw build stores with reaper and matting lofts for the presumed purpose of drying their coffee or keeping it dry, and then underneath laid lofts having ranges of cisterns exhaling damp, and sour stinks throughout the whole crop, besides keeping the foundations of the building more or less wet, with leakage, the wheel and water-courses, &c., setting aside the effluvia from the adjoining pulp pit.

Batta to coolies, coast advances, loss on rice, head Canganies, or any pay over 7*d.* or 8*d.* a day were never known in Ouvah, until brought in by Kandy planters, and it was discovered some time ago that some of them were actually giving the carters the usual wastage allowed them in Colombo *before starting*. I mention these trivial incidents merely for *Eye Glass's* information, and with the hope that he will look at home before going so very far abroad:—They are not much to be wonderd at though, after calmly considering the following, which is an indisputable fact. On the importation of the first lot of "*Justic*" into Kandy, it was not an uncommon sight in the streets to see some of the planters chewing it, *whole stick*—the taste for it though gradually abated, when the discovery was made that it was not "*sweetice*," as they originally believed, the lucky accident of a Calcutta man seeing them at it and detailing its composition, led to the discontinuance of the practice. Again I repeat, we have gained nothing from our connection with the west side, and could the convulsion of nature I mentioned, only occur now, we should, at any rate, escape being bored with the Currency question, those eternal Gas Works, and other essays the papers abounded with lately.—Yours faithfully,

Old Ouvah.

POSITION AND PROSPECTS OF THE COFFEE MARKET.

The remarks offered by you in recently received copies of the *Observer*, as to the favourable prospects of coffee, are amply justified by what is now happening in Mincing Lane. Day by day large lots of coffee are sold steadily and at full rates. And, if the information which has reached us here in London, as to the enormous deficiency in Brazil can be relied on;—(I fear to mention the figure, but the whole export of that great country has been stated to me as likely not to exceed 1,500,000 bags, *one third* of the figure which has been reached in its export annals) your anticipations are not only likely to be realized but indefinitely exceeded. The United State's consumption is now, in round numbers 200,000 tons and as the people of that country *must* have their coffee, it is clear that Java, Ceylon, India, and the other coffee countries of the world will be largely indented on to make up the deficiency in the supply of Brazil. But then Europe consumes, even after the exhaustion of the recent war, or will consume if it can be procured, a quantity at least equal to 200,000 tons more. Thus America and Europe will be competing for the produce of Ceylon, and the other eastern sources of supply. Let us hope then that "next" may be a year of unprecedented crop in Ceylon; for it will, according to all evidence, be a year of unprecedented average prices. A good authority, largely interested in coffee property in Ceylon, is certain that if only half we hear about short supplies as against increasing consumption be correct, the *average* for Ceylon "plantation" will, for the next year or two years, be at least 70*s.*, while if the whole of what is reported should be realized, it is simply impossible to fix a limit to the rise which may take place in prices. As far as Britain is concerned, plentiful and cheap supplies of tea will, I should think, act as a check, but over large portions of Europe no such check applies; the people have a passion for coffee and have not acquired a taste for tea. If therefore the best information obtainable and the opinions founded thereon of the best authorities, do not both turn out to be seriously erroneous, the prospects of those interested in the production and sale of coffee are for the next two years, and perhaps for many succeeding years, not only good but brilliant. Brazil, as you are aware, is in the first throes of the emancipation crisis, and how long that crisis may last, and how wide-spread and long-extended its effects may be in unsettling the relations between Brazil coffee growers and their labourers, it is impossible to say. All *good* men, who love human freedom, must wish speedy and peaceful success to the grand experiment on which the Emperor of Brazil and the best portion of his subjects have set their hearts. There is the example of the United States to afford encouragement, for there the Negroes, as free labourers, are equally exceeding the expectations of their friends, who hoped well of them and bringing confusion on their enemies who held that the Negro would do good work only under the coercion of slavery in the relation of "involuntary servitude." But a very large proportion of the Negro slaves of the United States were, if not educated in secular knowledge, at least imbued with the spirit of an evangelical, if a very simple and sometimes eccentric, Christianity. I suspect that the three millions of slaves in Brazil are in a very different condition, and that if in our own West Indian Colonies there was a disastrous reaction, and a long lapse of years before even a proportion

of those to whom slavery had rendered labour hateful and ignominious, came to realize the duty of honest and good work, the case may be expected to be worse in Brazil. It does not seem to be the order of PROVIDENCE that a great and crying injustice should be remedied without the wrong doers (in their individual or national capacity) passing through a baptism of retribution. It came on the Archipelago of the West in agricultural retrogression and commercial ruin, lasting for a generation. On the Northern portion of the Western Continent, the process was shorter, but beyond all comparison more awful, involving not only the temporary annihilation of many branches of agricultural and commercial enterprize, but such a fratricidal shedding of blood as the world had not previously witnessed. The same process is now going on in Cuba, the last stronghold of slavery in the Western World. Let us hope that Brazil, in her efforts to right a great wrong, may be spared the horrors of intestine strife, ere she has had time to recover from the exhaustions of a sanguinary foreign war. But all the operations of "God in history" seem to forbid the supposition that *some* retributive consequences will not visit the empire. The Emancipation Bill has passed the Chamber of Deputies, but not by a large majority, and its fate in the Senate is doubtful. Those who have had their profit by "this craft," notably those who have lent their capital on the security of human chattels, on mortgages not merely of land and crops, but of the bodies and "souls of men," naturally will hold their "securities" with a tenacious grip, and will only give way to the offer of "compensation" so enormousas seriously to embarrass the already depressed finances of the Empire. To take the most sober view, therefore, the probabilities seem to be that during the transition period of agitation and change which is before her, which may last many years, and which, if emancipation is witheld or much deferred, *may* be rendered memorable by a servile insurrection, a rising of those who *must* know, think over, and discuss what is proposed in their interest, Brazil will not be able to increase her production of coffee even if (which is doubtful) she is able to keep up the average of the past half dozen years. Readers of the *Observer* who have the advantage of independent sources of information can judge and act for themselves. But not forgetting how enormously the mere occurrence of a good or bad season in several of the producing countries influences the out-turn of coffee, and remembering the considerable breadth of young coffee, which a year may bring into full bearing in Ceylon especially, and to some extent in India and Java, it does seem that scarcely at any former period were the prospects of those whose prosperity is dependent on ready sales of coffee at high prices so good as they now are. Most fervently should I rejoice if a peaceful and perfectly successful revolution in Brazil from a system of slavery to gradual emancipation should enable that great empire—great in fact and grand beyond conception in prospect—to share in the benefits of the approaching prosperity. But we cannot ignore probabilities founded on the stern facts of the past; and therefore we can fairly assume a period of political and social strife, and of agricultural reaction in Brazil, as amongst the elements to be taken into account as justifying the adoption of a belief that a wonderfully good period prosperous "next years" are at hand for the coffee planters of the eastern world, especially those of Ceylon. "So mote it be."

MARKET REPORT.

COFFEE.—The coffee market shows less animation than last week, and the highest prices then paid have not been maintained, either for plantation Ceylon or East India, and a portion of the supply brought forward by auction was withdrawn. Native Ceylon afloat has been disposed of at almost former terms. The parcels brought forward were all disposed of at steady rates—500 casks, 100 barrels, and 50 bags plantation Ceylon—triage, 57s. 6d. to 60s.; small to bold grey, 65s. 6d. to 74s.; middling to good middling bold, 72s. 6d. to 80s.; peaberry, 53s. 6d. to 63s.; also privately, 800 bags native, at 65s. 6d. to 64s.

TEA.—The deliveries in London, estimated for the week, were 1,157,746lbs., which is a decrease of 14,518lbs. compared with the previous statement.

INDIGO.—There is no change to report in the prospects of the Indigo crop which continue to be as favourable as could be wished from all parts of the country. Planters, in parts of *Lower Bengal*, would be glad of a few showers to enable them to finish their spring cultivation, but to judge from the appearance of the weather here they will probably have had them by this time. The plant is reported to be growing splendidly in *Tirhoot*, *Chumparun* and *Cawnpore*; caterpillars have appeared in one or two concerns, but the damage done by them has been very trifling. Altogether we have seldom known a season open with such uniformly good prospects, and with a continuance of good fortune during manufacture, we may look for a bumper season.

Exports of Indigo from 1st November 1870, to 1st April 1871:—

	Chests	Mds.	S.	Ch.
To Great Britain	16,480	82,175	14	0
" France	513	1,867	13	8
" Trieste	2,790	10,538	4	1
" Foreign Europe	250	953	9	6
" America	2,546	8,773	25	12
" Gulphs & Levante	1,731	6,758	10	4
Total	24,060	91,067	0	15

RAW SILK.—We have no improvement to report in this market; prices cannot be quoted lower, but buyers are unwilling to operate; the present complication of affairs in France keeps business at a stand still, and a speedy settlement thereof is necessary to induce buyers to come forward at current rates. Good offers have been made for March hand filature Silk to arrive, which owners have refused; the only sale of filature is 75 bales of the [J D] Cooldah which is reported at the high figure of Rs. 23-8. The new Silk of the March hand will be here in a few days, and if producers will sell at reasonable rates, a fair business will no doubt follow.

TEA.—A small sale of 488 chests was held on the 21st ultimo; of this quantity the greater part was "Green Tea," which, in the absence of high enough offers, had to be withdrawn. Prices for other kinds remain unaltered.

Public Sale Prices.

ASSAM.—*Cinnatolliah Garden*—Broken Pekoe Rs. 1, Pekoe Souchong annas 12½, Souchong annas 11 .. .. 70 Chests, Average Rs. 1[illegible] per lb.
MAIJAN GARDEN—Fannings, Rs. .. .. 111 " " " "

William Moran & Co's. Circular.

CEYLON EXPORTS FOR FIVE SEASONS.

WE append our usual comparative return on the close of the season ending 30th September. It embraces the exports for five years back, and affords the best possible criterion of the actual out-turn of crop during each season. Usually, a portion of the new crop of the succeeding season is despatched as early as August, while perhaps some of the old crop does not come on for shipment till October; but this being the case more or less every year, the balance is well maintained, and the practice which obtains in Brazil, and Java, from the absence of proper communication with the coast and cheap transport of sending to the shipping port the crop of a couple of years at the same time, is unknown in Ceylon. The following table shews that our coffee exports for the past season are not only 100,000 cwts below those for 1869-70, but 83,000 and 46,000 cwts. below those for 1868-69 and 1867-68 respectively. The great falling-off this season has been in plantation kinds, while native actually shews a slight improvement on the previous export, although far below the export which ruled some years ago. As respects the distribution, the most striking circumstances is the small export during the past season direct to France, but this was made up by a full cargo of plantation and native—the first of its kind—sent to Hamburg. We must allow the figures to speak for themselves:—

COMPARATIVE TABLE OF COFFEE EXPORTED FROM CEYLON TO VARIOUS COUNTRIES IN THE YEARS ENDING 30TH SEPTEMBER 1867, 1868, 1869, 1870, AND 1871.

Countries.	Plantation.					Native.					Total.				
	1867.	1868.	1869.	1870.	1871.	1867.	1868.	1869.	1870.	1871.	1867.	1868.	1869.	1870.	1871.
Great Britain	614,634	604,301	787,008	624,862	738,797	174,061	230,746	151,462	79,625	102,981	788,695	835,147	938,565	704,487	841,778
France	8,942	4,272	11,346	14,907	966	9,970	6,554	22,126	11,731	832	17,671	13,826	33,472	26,638	1,798
Trieste, Venice,	....	....	....	7,934	8,971	....	....	....	2,251	30	....	....	....	8,517	8,901
Syra Gulf, & Suez	....	....	....	15,013	7,205	....	....	....	600	512	....	....	....	15,613	7,717
Australia	9,486	11,851	14,001	18,936	11,337	1,198	2,169	2,169	1,704	3,417	10,684	14,020	16,170	19,743	14,754
America	....	270	5,070	9,936	6,160	11,378	22,815	24,791	20,225	24,346	11,378	23,085	29,861	30,121	30,371
Mauritius	....	536	....	866	....	....	12,572	15,425	1,695	1,615	....	13,107	15,425	2,561	1,615
Cape and the East	31	....	64	129	3,227	1,965	3,504	7,914	835	645	1,996	3,504	7,978	1,093	3,872
Gibraltar	....	....	....	5,397	....	2,370	....	....	....	....	2,370	....	....	5,397	....
Hamburg	5,000	....	....	....	12,556	....	....	....	....	3,301	....	....	....	....	15,856
Total	637,303	713,315	777,560	800,410	786,925	200,980	328,360	223,033	135,824	136,388	837,303	963,671	1,000,033	1,019,842	923,376

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

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Agricultural Gazette of India.

CONTENTS.

NOTICES TO CORRESPONDENTS.

We trust that our friends will recognise their questions in the garb we have decked them in: if in this shape they do not altogether convey the meaning intended, we shall be glad to correct them in our next issue. We often experience much difficulty in discovering what it is our friends really want to know. We must ask them to be good enough to put their questions as definitely and as plainly as possible.—Ed. *A. G. of I.*

How should land be prepared for a cotton crop; how should it be manured; how much seed will be required per acre; and how should the seed be sown?

The soil should be well worked by ploughing and cross ploughing, and thorough grubbing. You may sow on the flat, or on the ridge; in a wet district we should prefer the latter arrangement. We do not approve of applying nitrogenised organic manure directly to the cotton plant; with such manure the tendency of the plant is to produce wood and leaf. We consider it a far better arrangement to apply a heavy dressing of foldyard manure to the previous crop, and apply only mineral manures to the cotton crop. Sow from 10 to 20 lbs. of seed per acre; if it is a large growing species, sow 10 lbs; if one of the ordinary country kinds, sow from 15 to 20 lbs; always sow in drills whether you sow on the level, or on the ridge. Place your drills from 4 to 6 feet apart according to the species. To economise space sow a row of maize or millet between the rows of cotton. Some remarks on this subject will be found in our notice of Mr. Login's Report on cotton cultivation in the Punjab.

I have a litter of fifteen young pigs, which is the most profitable way of disposing of them?

The number is too large for any sow to bring up well, especially in this country. Unless the sow is a very large one, you had better drown 2 or 3 at once, or the whole lot will be injured. Of the dozen that will remain you may, when about 6 weeks old, sell 3 or 4, as roasters, for which purpose, they will in most districts command Rs. 3 each. The remainder may, unless the breed is worth preserving, be fattened and sold as Porkers, at 6 or 9 months old, when they will, if of average size and in good condition, sell for 20 to 25 Rs. each.

You recommend Saltpetre as a manure; to what crops would you apply it, in what quantity, and in what manner?

Saltpetre, Nitrate of Potash, is certainly the most valuable manure we possess, not even excepting Peruvian guano; true, it contains none of the phosphatic material so valued in guano; still, by adding bone-dust, this fault is easily remedied. So mixed you may apply it to any crop, tobacco, maize, and most of the ordinary grain crops. Mixed with bone-dust, in equal weights, it is a useful application for the cotton crop, apply say 100 lbs. per acre of the mixture as a top dressing, either during showery weather, or after heavy rains, if applied during dry weather, hoe it in with the bullock hoe or hand hoe.

It is said that the inferior size of Indian Stock is due to the small proportion of phosphatic materials in their food, and that if a small daily supply of bone-dust (which contains phosphates) is given in the food of young animals, they will grow up stronger timbed: is this the case?

We have not the least doubt but that one cause of the inferiority of Indian Stock, and we may add Indian people, is the great deficiency of bone material in the agricultural produce of this country; but we certainly do not believe that in the case of herbivorous animals any good would result from a daily dose of bone-dust. The only way of strengthening the bone of growing animals through the agency of bone-dust or any similar phosphatic material, is to apply it as a manure to crops; these crops will take up and elaborate the phosphatic material in a form in which it can readily be assimilated by herbivorous animals. But the chief cause of the small size of Indian Stock is, we believe, the stinted food and hard living they have been subjected to for so many generations. The now famous English horse did not exist in the 17th century, when nothing England could produce was thought comparable with the small horse from Arabia and Barbary.

At what age should a young heifer be put to the Bull?

Much will depend upon the breed of the animal, certainly not before she is 20 months old, probably if 24 months old the results would be better. We have, in England, seen well bred and short horn heifer, not over 18 months old, that appeared as thoroughly developed and matured as many animals are in this country when nearly 3 years old. You must not be altogether guided by the age, use your observation If your management has been such, that your heifer never lost its calf flesh, but was always kept in good condition, it may safely be put to the Bull 4 or 6 months before that of your neighbour's which may have been kept on the starvation system common amongst our humane (?) Hindu cultivators.

LETTERS TO THE EDITOR.

THE FORESTS OF THE HIMALAYAS.

N. W. Provinces.

To the Editor of the

Agricultural Gazette of India.

Sir, I send you a few lines on the subject of my late experiences in extracting timber from the pine forests of the Himalayas.

The importance of their future good management must be my excuse for troubling you on the advisability of forming plantations of trees on either side of the lines of railway, to be placed in charge of Rangers each, in addition, having a small area of arable land attached, whereon improvements in the growth of seeds of the neighbourhood could be made.

It is from the fact of India becoming year by year more and more denuded of trees that the land cannot yield sufficient nourishment for the ever-increasing population, and that famines are becoming of such frequent occurrences.

The Rangers should not be placed at greater intervals than one mile apart on either side of the railway or river on which they may be fixed; they should all be married, and should be the pick of the Regiments.

A scheme of this description, well advertized in England, would prove a great attraction for a respectable class of men to join the army with the hope of enjoying the benefits that would accrue if they behaved themselves properly while in the regular service.

It should be obligatory to serve a certain number of years, say seven, also to pass examinations in reading, writing, and arithmetic, as well as in agriculture, and a thorough knowledge of drill should likewise be insisted upon. My experience of the quasi independent hill territories leads me to the belief that it is the greatest piece of folly, on the part of the paramount power, to allow them to exist side by side with our (slightly) better ruled State. On the one hand their subjects become dissatisfied at observing the difference between themselves and the inhabitants in British Territory, (the rascality of the native subordinates in British employ are bad enough, but the extortions of the native Rajahs are perfectly wonderful), and on the other the large landholders of Oudh, Punjab, and N. W. Provinces are irritated that they also have not the same power over their unfortunate ryots to squeeze and plunder them at their own will, and without any interference from the neighbouring Magistrate. Thus a large portion of the population in and adjacent to the territories of the feudatories are even in a chronic state of restlessness, from the highest to the lowest, each of its kind anxious for a change that may, in the one case, bring back the old days of rapine and bloodshed, and in the other removal to the protection of a better inclined system of Government.

Even the improvements that are so permanently brought before newspaper-readers, as occurring in native States, would hardly bear the investigation of men of ordinary common sense, but must be seen through the rose-coloured spectacles of a political official.

For any real and permanent good even to accrue to the natives of India, a large farming population of Englishmen is required in every district. The native requires to come into contact with Europeans totally unconnected with the Government service: these latter they fear, and adopt changes simply by order when suggested to them, but in the former instances having no dread of the man, they would be more open and communicative, and also more apt to copy improvements in husbandry after they had seen (for some years) that they would benefit thereby.

The Forest Department appears to me to require an entire re-modelling and to become Conservators, instead of mere timber traders as they are at present.

December 20th 1871.

HIMALAYAN ENTERPRISE.

TEA CULTIVATION.—No. V.

To the Editor of the
Agricultural Gazette of India.

SIR,—The building of the factory described in my last (the materials being all ready on the spot having been previously collected) would occupy the planter for the greater part of the third year added to the getting ready, terracing, and planting of 30 acres more of land.

Not a yard of soil should, in my opinion, be planted (in the hills) without terracing. Terracing is the plan which has for countless ages been adopted both by the natives of India and China, wherever hill-cultivation is in question, and it is not to be supposed that they did so without good reason. Some people suppose that terracing, though requisite in the mountains for grain crops, the seed of which would otherwise be washed away by the heavy downpour of the monsoon, is *not* requisite for shrubs and bushes, such as tea, coffee, &c., and that these do better on properly drained slopes.

To this I submit that the wash plainly (as they themselves admit) *does take place* on slopes, and that it is therefore a mere question of time for the roots of plants set upon the said slopes to be laid bare, that draining, unless carried out on such a scale as to be in the long run *more costly than terracing*, does not protect the plants from the wash, especially under high cultivation, whereas once your ground is properly terraced, you are safe for ever.

Some again, who have never tried terracing, are frightened at the supposed expense, this however is a mistaken notion. I have found by experience that *good terracing* can be executed at the rate of Rs. 60 per acre, and I very much doubt if digging the ground up (when not terraced) to a depth of 10 inches or two feet, (as those who plant on slopes do), will not *cost more*, the reason being that the hill men are *accustomed* to terracing, all their cultivation being carried on in this manner, whereas they are not accustomed to deep hoeing. In the third year the planter will do well to commence early, and get thirty acres thoroughly well laid out for planting in the manner above described, or forty if his manure is likely to hold out.

I forgot to mention that he should, in the second year, have put down 50 to 100 maunds more of tea seed, making another nursery of one or two acres, so as to have plants coming on yearly, and the same the third year. These nurseries will eventually form part of the acreage under tea, as plants are left at intervals when the rows are planted out.

By the end of the third year, the factory and plant should be completed, and in the spring of the fourth, the ten acres planted in the second will be yielding probably 150 to 200 lbs. per acre, if well manured, in the preceding autumn. Thirty more acres terraced and planted during the rains of the fourth year, will bring the area under tea to 70 acres, while the fifth year will, at the same rate of progress, show the full complement of one hundred.

In the fifth year, the ten acres first planted will be yielding 300 to 400 lbs. per acre, while the thirty acres planted during the third year will have come into bearing.

In the sixth year, 70 acres will be giving a good return of leaf, and the seventh season will show the whole hundred (100) acres in yield, though the maximum yield will not, in all probability, be realised before the tenth year.

At that epoch (always of course supposing that the proper amount of food in the shape of manure, the one thing absolutely necessary has been supplied to the plants) the planter will witness a perpetual flush lasting from the middle of April to the middle of October, giving him as much as he can do with the assistance of all the women, children, and tag rag, and bobtail of the neighbouring villages to gather.

If the bushes yield 1,200 lbs. *leaf* per acre, he will realise 30,000 lbs. of made tea; but it is more than probable that, under the circumstances, 2,000 lbs. of leaf, or 500 lbs. made tea per acre, will be the actual out-turn, as from 700 lbs. to 900 lbs. (nine hundred) made tea has been obtained from highly-manured plots in the N. W. Himalaya. It will cost the planter, at a rough estimate, eight (8) annas per pound all round, to cultivate, manufacture, pack in lead and box the tea, and say two (2) annas more to take to market: his schedule will therefore stand somewhat as follows:—

100 acres will yield at 300 lbs. made tea per acre, 30,000 lbs.—

Value 1 Rupee per pound	Rs. 30,000
Subtract cost of manufacture, &c.	" 15,000
Carriage to market (2 As. per lb.)	" 1,875
(Profit)	Rs. 13,125

100 acres yielding 500 lbs. per acre made tea, 50,000 lbs.—

At 1 Rupee per pound	Rs. 50,000
Subtract cost of manufacture, packing, &c.	" 25,000
Ditto. carriage to market	" 3,125
(Profit)	Rs. 21,875

Well-manufactured tea often sells for Rs. 1-2, 1-4, and even 1-8, at the auction. At Rs. 1-2, the planter would clear his Rs. 15,000 profit; in the others of course more.

Now one more piece of arithmetic in order to estimate the expense since the commencement of the 3rd year.

* Building factory	Rs. 3,000
Terracing and planting 30 acres	" 2,100
Manuring do.	" 150
Grain for cattle	" 900
Pay of ghorawallas or herdsmen	" 360
Carriage of grain	" 150
Cutting and stacking grass	" 200
Cost of living of planter	" 1,200
Odd expenses	" 200
Nursery of two acres	" 100

Expense of 4th year the same, deducting 3,000 Rs. for factory now finished,—

Brought forward	Rs. 8,360
Expense of 4th year	" 5,360
Do. of 5th year, 100 Rs. for nursery	" 5,260
Total expenditure from 3rd year	Rs. 18,980
Brought forward expenditure up to 3rd year	" 18,760
	" 18,980
	Rs. 37,740
Add for 3rd year weeding (10 acres)	Rs. 50
For 4th do. do. (40 do.)	" 200
For 5th do. do. (70 do.)	" 350
Brought forward	" 37,740
Add (for weeding)	" 600
Grand Total	38,340

(Up to end of 5th year.)

The yield of tea for the 6th, 7th, and 8th years would be something considerable. 70 acres would be in bearing in the 6th year, yielding all round 200 lbs. per acre or thereabouts, thus:—

70 acres at 200 lbs. per acre, 14,000 lbs. in the 7th year, the whole area of 100 acres would be giving a return at about the same rate (all round). In the 8th year the yield per acre may safely be fixed at 250 lbs., reaching its maximum of 3 to 500 lbs. per acre by the 9th or 10th year. The return realised in the 6th, 7th, and 8th years, deducting cost of manufacture, packing, and carriage, would not be less (even taking the lavish average of 1 Rupee per pound) than Rs. 24,000.

This sum, after deducting Rs. 4,000 for the planter's private expenditure leaves a profit of Rs. 20,000, which will go far to cover the expenses incurred and the capital laid out on the plantation, while the profits of the 9th and 10th years, at the maximum yield of 300 to 500 lbs. made tea per acre, should do so entirely, leaving a surplus to boot.

It is thus clear that capital of 40,000 or 50,000 Rs. † *judiciously laid out* will, at the end of ten years, bring in an annual profit of Rs. 15,000 or thereabouts, and this after *paying its own expenses*.

The price to be paid for their investment would, it is true, see isolation for the greater part of the ten years in the wilds, and also of tolerably unremitting attention to work for the same period. *Per contra* the work is healthy work in a fine climate, and the solitude can be varied by occasional visits to a station or to neighbouring planters, while the very fact of isolation, I think, disposes many men to work hard if only to make the time pass.

In conclusion, I may remark, that though, as I said before, I have allowed a margin for inexperience, yet my estimates include a certain amount of *savoir facie*, and knowledge of the country and of native character, without which I doubt if any man could construct an estate at the rates I have set down, no matter how hard-working he might be.

MINERAL AND SALINE MANURES.

To the Editor of the
Agricultural Gazette of India.

SIR,—It is the custom in India, when Agricultural subjects are discussed, to advance the opinion that improvements are impossible, because the only manure of the country, cow, and ox dung is made into cakes, which, after being sundried, are used as fuel.

The gentlemen who know all about it, call on the Government to form "Fuel Plantations" wherever needed, and then say they "cattle-dung will be turned to its legitimate use as manure, and the finest crops of wheat, maize, and Indian corn (the large millet of America and *jowar* of India) will be produced throughout the length and breadth of the Empire, to the great advantage of all concerned."

* Cost of collecting materials, timber, &c., given in former account.

† Rs 50,000 would allow for greater expenditure (private) on account for building a bungalow, laying out a garden, making a large outhouse, &c., &c., &c.

It will perhaps astonish these gentlemen to be told that, with the exception of Spain, there is no other country in the world which possesses such a varied, valuable supply and fresh multitude of mineral manures for India.

My object in bringing these manures to prominent notice, and I will do so in accordance of succession, which will indicate their value, as well as give them a distinctive number, by which they shall be known hereafter.

NATURAL MINERAL MANURES.

1st, Fossil Phosphate of Lime; 2nd, the fragments of Limestone or Matrix in which they are imbedded; 3rd, *Kankar* dust or powder made by pounding or grinding Lime producing *Kankar*; 4th, calcined Lime, made from *Kankar*, all kinds of Limestone, shells, and coral; 5th, Magnesian Limestone, including the Magnesite, or native carbonate of magnesia, of Madras; 6th, superior marl; 7th, Red or Ferruginous marl; 8th, Steatite or Soapstone; 9th, Sulphate of Lime or Gypsum; 10th, Red and Yellow Ochres; 11th, Sulphate of Iron; 12th, Iron and Manganese clays, or disintegrations of rocks containing these metals. In the Himalayas—"*Kala mak kole*" is the native name for this substance, and it is much used for flat roofs in place of ordinary clay.

NON-FOSSIL MINERAL MANURES.

1st, Animal bones and bone dust; 2nd, Calcined bones or bone ash; 3rd, Fish bones, and Fish scales, Crab, Lobster, Prawn and Shrimp shells; 4th, Squeezed Sugarcane (*Megass*) Ashes; 5th, Wood, brushwood and charcoal ashes; 6th, Ashes of all kinds of weeds and straw; 7th, all kinds of Brick-dust, Brick-kiln ashes and refuse, roasted earth; 8th, old crumbled down and refuse mortar.

SALINE MANURES.

1st, Muriate of Soda or culinary Salt; 2nd, Nitrate of Potash or Saltpetre; 3rd, *Nitrate of Soda*, (or *shore sujee*). 4th, Sulphate of Soda (or *Khares Neemuch*; 5th, Crude, native Carbonate of Soda, (or *Sujee Mittee*); 6th, Salammoniac, (or Noumdur); of these numbers one to five are under the excise.

ARTIFICIAL MANURES.

1st, Super-phosphate of Lime; 2nd, Bi-sulphite of Lime; 3rd, Wood and vegetable charcoal.

India therefore possesses a total of 29 manures, of which 12 are mineral, 8 non-fossil mineral, 6 saline, and 3 artificial.

Two of the artificial manures require sulphuric acid and sulphur for their manufacture, and are of great value. But the use and importance of charcoal requires explanation to be understood.

CHARCOAL.—The dust and riddlings of charcoal which are now wasted possess remarkable chemical properties. 1st, charcoal evolves ozone, and absorbs oxygen, ozone acts as a purifier of the air and destroys malaria: 2nd, it acts both as a deodoriser, and disinfectant; 3rd, one cubic inch of charcoal will absorb 36 cubic inches of carbonic acid gas, 10 of ammoniacal gas, 55 of the deadly sulphuretted hydrogen, 5 of the deleterious carburetted hydrogen or ditch gas, and 7·50 of nitrogen; 4th, it attracts and retains moisture, and I believe produces water by catalytic chemical action, between atmospheric oxygen and the hydrogen of certain gases.

The roots of growing plants absorb or extract the condensed gases (suited to their wants) from the charcoal, and in this manner, though not a manure itself, it provides substances which act as manures, and as charcoal is imperishable, its chemical value, when present in the soil, is exceedingly great.

With this information before us, it is rather absurd to talk of India being deficient in manures. Cow-dung is well enough in its way as a leaf producer, but it is of very low value as a supplier of mineral matters, of which it does not contain one-and-a-quarter grains in the hundred, whilst wheat contains five per cent. in the grain alone. We learn from a careful analysis, that 100 grains of stall-fed cow's dung contains only 0·46 of a grain of the phosphate of lime and as 365 pounds of first class whole-meal wheat flour contains 3 lbs. 6 ounces 4 drams and 44 grains of this most important substance, a simple calculation will show how utterly impossible it is to expect the half-starved Indian ox, and cow, fed on inferior grain, grass, and straw, to produce even one grain thereof in half-an ounce of manure.

Amateur agriculturists should bear in mind, that when proper mineral matters are deficient in the soil, the plant will take up silica to make good the deficiency, and as silica is of no value to man, the wheat in which it is present in excess, may indeed weigh 60 lbs. to the bushel. But what is the good of it? Flinty wheat is held in very low esteem and can be easily recognised, therefore it will be found very unprofitable to raise wheat, in which the principal mineral matter is flint or silex, instead of the phosphates.

The quality of the wheat of India, as compared with that of Europe, is most decidedly inferior, and it is my duty to show that, unless saline and mineral manures are used, no improvement is possible. The reader may convince himself of the inferiority of Indian wheat and its flour by tasting or eating a Dinner biscuit, made of Indian flour, and then trying one made by "Huntly and Palmer," London. The remarkable difference in flavour is due, not to any secret in baking and manufacture, but to the superior quality of the wheat and its flour. To improve the wheat of India, saline manures, Nos. 1 and 2, and mineral manures Nos. 1, 2, or 4, will have to be applied to the soil, the latter directly, the former by being dissolved in water, and applied or sprinkled over any vegetable manure before use. By vegetable manure is meant leaves, weeds, refuse, straw, stubble, grass, and roots chopped up and stored in a pit, to ferment and pass into manure, rich in humic acid.

The fermentation may at all times be accelerated by dissolving a seer of molasses in a gallon (or four gallons of water), and sprinkling the stacks therewith, or a seer may be needed to moisten the heap. An allowance of one seer of molasses to four maunds of 82 lbs. ea cash, of vegetable refuse, will be ample. Of course the manure-making is to be taken in hand, when the rain crops are reaped. But if such a manure is not forthcoming, the lime, or kankar dust must be watered with the nitrous solution, and the same weight of soil will, after being pulverised, have to be mixed with dry salt in powder. The fossil phosphate of lime reduced to powder should now be added, the compost well mixed together, and when ready, applied to the surface of the ploughed land, which should then be harrowed and prepared for sowing.

The wheat should be sown after the above manure has been harrowed (not ploughed) into the soil, and if Captain Hallet's system, pursued by him in producing his "Pedigree wheat" and by all accounts successfully imitated by Mr. Login be adopted, a vast saving of seed wheat will be effected, and the young crop will be produced under great advantage. When fairly above ground, *i.e.*, between 4 and 6 inches high, farmyard manure, if available, whether fresh or stale (Mechi says the fresher the better for use, and he is a great authority for ploughing in fresh manure) should be applied by hand as a top-dressing. This mode is prevalent in these Hills, and prevents deer, wild goats, and hares from eating up the young corn. Its value is obvious. The ammonia as evolved, is absorbed by the leaves or blades of the growing corn, to the great advantage and benefit of the plant, and the first fall of rain sends all soluble matters into the soil, where the rootlets enjoy the first and best portion of the banquet, and allow the roots to wait for what is left. The standing crop will be weeded as often as necessary; the weeds should be gathered, taken to the pit, and be converted into vegetable manure for future use.

If the land is under canal irrigation, and suitable water is supplied, the zemindar has every right to expect a full harvest of first-class wheat, weighing like that of England, 60 pounds to the bushel, and containing the smallest quantity possible of silica, and all other valuable mineral matters in the greatest abundance.

I think I can hear the reader say:—"Well, all this is simple and easily enough, and who prevents or is to prevent its being carried out?" The reply need not be given here, though with the facts before him, the reader will have no difficulty in obtaining satisfactory answer to his question. H.

THE POULTRY YARD.

THE *Albany Country Gentleman* contains an article headed "How to make poultry profitable." The remarks are the result of much *interested* experience, and as such, are of not a little value. But much of the article applies only to a cold climate.

None of the many attempts at farming that have been made in India have, to our knowledge, proved successful. Many circumstances have contributed to this unfortunate result. But it would be a matter of great regret if the project were given up as a practical impossibility. It is our firm conviction that cattle and sheep farming would prove most successful in this country, and form a source of large profits to the individual or company that could only contrive to overcome the obstacles that have hitherto stood in the way of remunerative farming, and to establish the undertaking on a firm footing.

A large stock of poultry—geese, turkeys, ducks, fowls of sorts, pigeons—could not fail to be a most lucrative addition to such an enterprize. These birds multiply like mice out here, with little or no care, and even with the most trifling supply of the cheapest food. The heaps of eggs—small bad eggs, it is true—and the baskets-fuls of chickens and fowls exposed for sale in every market, are procured at a mere cipher of cost. Every family has a few fowls running in and out of their door, and feeding for the most part on the refuse of the town or village. We believe we are within the truth when we state that two or three handfuls of the cheapest corn, once a day, is all that any native gives to his stock of poultry. Still, stunted and ill-flavoured as the birds are, we are all only too glad to have them on our table; and far short as their fecundity must be compared with what would result from careful rearing and plentiful feeding, it is yet sufficient to make the keeping of poultry a most profitable business to the whole labouring classes of India, so that the following excellent remarks do not apply in their full force to this country:—

> Many persons suppose they have only to lay a few hens, no matter as to age and condition, turn them loose, allow them to pick their livings as they can, occasionally giving them food, seldom water, allowing them to roost on trees exposed to the cold and storm, or on the farm waggons and other implements—and then, if they do not lay an abundance of eggs, cry chickens, humbug, nuisances, no profit, &c.

In order to make the greatest profit out of a stock of poultry it is necessary to keep everything about them scrupulously clean, and to allow them plenty of fresh air, especially by

night, and wide scope to roam at large for exercise and recreation. They should also have easy access at all times to *cold* and pure drinking water, which should be supplied moreover in unlimited quantity, and very clean, to the ducks and geese to swim in, and to the pigeons to bathe in. Turkeys and fowls like to lie and roll in sand or dust, a habit that tends greatly to keep them free from lice and other even more injurious parasites. For this purpose, a piece of ground in a sheltered and secluded spot, should be covered with a layer of sand, which should be often swept and cleared of stones, sticks, straws, &c. Poultry thrive best when they can indulge at pleasure in their taste for worms, snails, and insects, together with pickings from grass and weeds. With this in view, the common mistake of keeping fowls in a place "fine and clear" as a cricket ground, with only a shed for shelter, will be avoided. Green trees, green shrubs, and green grass, are indispensible to a flourishing poultry-yard. Of course the vegetation should not be allowed to grow rank, and all dead leaves and branches should be removed.

With regard to food. It is the worst policy to try economy by giving poultry any but the richest nourishment. Moreover, the food should be varied a good deal; *jowaree* from January to December is a great mistake. We quote once more, putting a passage or two in italics.

> I go to my hen house early in the morning, before the fowls come down from the roost, and having previously *scattered over the feeding floor fine gravel, some burnt bones and oyster shells*, I then throw on the floor the feed for the day—a mixture of 3 parts corn, 1 oats, 1 barley, and 1 wheat screenings, in the proportion of 1 quart to eight or nine fowls, depending somewhat on the size of them; also four pans with pure clean water—lock the door and leave them for the day. About twice a week I give chopped cabbages, turnips, onions, and the like; and twice a week meat scraps, soaked in water the night previous. In warm weather, I give in lieu of vegetables, grass, clover, weeds, &c., in the outer yards—*sometimes a little sweet corn in the ear. I seldom feed meal, boiled potatoes and slop feed, believing they are more conducive to fat than to eggs*; and during very cold weather, I think it injurious to the fowls to fill their crops with wet food. When I do feed this for a change, I add a little salt and pepper to warm them up.

It is not generally known that curds (or *dhai*) is a most wholesome and nourishing article of diet for poultry, and materially increases the number of eggs laid. It should be mixed with bran. Native servants will be found, almost without exception, to offer every objection to this use of one of their most coveted perquisites, but no credit should be given to their "authenticated instances" of the injurious effects of feeding fowls on dhai. Onions, though disagreeably tasting the flesh, are excellent food for fowls. They will not eat more of it than is good for them. The eggs of white-ants are of great importance for chickens, and are indispensible to the successful rearing of young guinea-fowl.

The plan of locking poultry up in an enclosure, while it leads them a life the reverse of natural, and makes them wholly dependent on man for that change of food which their instinct teaches them to find for themselves, is a safeguard against the ravages of animals of prey. In our opinion, by far, the most destructive of these, nocturnal and diurnal, is the common pariah kite. It is scarcely feasible to let young chickens into the open air, without having one after another carried off by the sudden swoop of this active and watchful pest. In many parts of the country, especially in the vicinity of hills, hawks and eagles are very common; and these commit dreadful havoc among pigeons. Skin parasites, though terribly destructive when not guarded against, need be no cause of alarm. Regularly employing cow-dung on the floor of the fowl-house, and the whole inside of the pigeon boxes, effectually keeps down every species, except the gad-flies which infest pigeons, and which have to be caught and destroyed with the hand, whenever they can be found. The floors and walls should also be from time to time sprinkled with water in which unslaked lime has been dissolved, and with an infusion of tobacco juice. The former has an astonishing effect in giving a bright and clean appearance to a poultry-yard. White-washing should not be neglected.

In this country little regard need be paid to the weather. We never saw fowls much the worse for even a thorough drenching. But every poultry-yard ought to have a shed affording shelter from rain. It is important however to keep the sleeping places very dry. The birds should be encouraged to roost, not the ducks and geese of course.

Cleanness and wholesome food will effectually prevent most diseases, for fowls of all kinds are incredibly hardy, young ducks alone excepted. Curious to state, however, numbers of ducks and fowls drop down suddenly, and without any apparent cause, about the month of February. Attention to the subject would, without doubt lead to the discovery of a remedy against this serious fatality.

The article in question contains many particulars relative to the breeding and rearing of poultry, and some statistics, from the writer's own experience, showing the profits that may be derived from a good stock of poultry.

When the attempt is made again in this country, as we hope and feel sure it will be, it would be well to postpone the expensive though excellent plan of securing a stock of English, Cochin, Surat, and other large and fine sorts of fowls. The common bazaar fowl can soon be brought to triple and quadruple its annual number of eggs; and from the increased size of the eggs which speedily results from good feeding, we do not doubt that two years would suffice to produce a generation of well-sized birds.

MR. LOGIN'S EXPERIMENTS.

Mr. Login's report on cotton cultivation in the Punjab, on the Egyptian system, should convince the most sceptical of the desirability of at once making every effort to induce the adoption of that system in preference to the native one in all parts of India where cotton cultivation is carried on. Mr. Login's statements are very clear. He has brought facts and figures together in such a way as utterly to dispel any misgivings that might be entertained as to the advantages of the system, and also to reduce to a minimum the weight of any arguments urged on the contrary side.

Mr. Login gives the details of the cultivation and produce of four experimental cotton fields, averaging in extent from ¼ to ½ of an acre approximately, and lying at intervals along the road between Umballa and Delhi, a distance of 120 miles. The experiments seem to have been very fair, having been conducted under a full share of the misfortunes of floods, shade, stray cattle, and squirrels, while last, with parrots, appear to have destroyed a large number of the plants on one of the fields.

The prominent features in the new system of cultvation, as compared with the native system, are 1st, thin sowing, so that the plants can draw the necessary nourishment from the soil; and 2nd, careful cultivation, in the form of plentiful ploughing, manuring, watering, (when needed), and weeding. With reference to the manuring it must be noted that the 1st and largest field was not manured, *but irrigated*: and that the 4th field was neither manured nor irrigated. This one had been under grass for ten years. It might naturally be supposed that this steady attention to the fields would entail serious cost, but Mr. Login shows that the expense was trifling, and not worthy of account at all when compared with the enormous profit.

The following table shows the estimated produce of this year's crop on the four experimental fields:—

No. 1	3-4th	acre	532 lbs. per acre, of clean cotton.	
No. 2	2-7th	"	399 "	"
No. 3 .	5-16th	"	236 "	"
No. 4	9-20th	"	260 "	"

In describing the cultivation of the first field, Mr. Login has gone into the minutest details, and estimates (not too sanguinely) that there will be a clear profit of 330 per cent. on the cost of labour and the seed.

These results cease to appear astonishing when we compare the two systems of cotton cultivation, and reflect that the natives find it *profitable* to give up, to a considerable extent, the cultivation of grain for that of cotton *on their own system*. All those who have seen Indian cotton fields know that natives make little or no difference between the sowing of cotton and the sowing of jowaree. A cotton field ripe for picking might easily be mistaken for a grain field—plants from 1 to 2 feet high, a few inches apart, and bearing from 12 to 20 pods each. But Mr. Login describes five branching shrubs, *pruned down* to a height of five feet, growing from 2 to 3

feet apart, and with an average of 140 blossoms each; one plant, if plants they can be called, having no fewer than 270 blossoms, and another 276. It will now appear no more than what should be expected that the fibre of Mr. Login's cotton exceeded by one-third that obtained on the native plan. It remains to be added that Mr. Login gives his observations on some additional experiments, conspicuously a venture by a zemindar; and the results are much less satisfactory than might have been reasonably laid account with, considering the great disadvantages attending these small operations. We give two quotations from the report:—

"Surprising as these figures may appear, yet they are not more "so than seeing the field itself, and proves to my mind, if I ever had "any doubts, that India can and will compete with the world in "the produce of this great staple of industry."

"Should the ultimate result be that the Indian cultivators, by "the introduction of this Egyptian system, can only produce half "this average, what a boon it will be both to India and England."

It seems to us that Mr Login is disposed to value unduly the apparent effects of his experiments upon the native mind. The stubbornness with which the natives run in the groove they and their fathers have been accustomed to, in the face of all reason and in spite of any pressure that can be brought to bear upon them, is almost incredible. Even granting that the gratification which Mr. Login remarked was not put on to please the "Sahib," we greatly doubt if, were their sincerity practically put to the test, the people would not, as they have done whenever they have been urged to adopt the English plough, obstinately take to their own way without approving or disapproving of the new system. And how little impression or recollection of what they have seen will they retain when a year has passed away and the cotton season comes on again.

The 13th, 14th, and 15th paragraphs are left out of this report as printed in the *Punjab Gazette*. These paragraphs contain suggestions upon the manner in which the system may be introduced. What these suggestions are, we do not know; but it occurs to us that we should be careful lest too much pecuniary inducement and encouragement be held out to the people as they will certainly take ill with having that assistance withdrawn. To get the natives to consent to even these experiments treated of in the report, Mr. Login had not only to guarantee them against loss, but also to hold out strong hopes of *extraordinary* gains.

Mr. Login says that the people are inclined to suspect, that under all these efforts at superior cultivation, lies a design to enhance the land rent. This is nothing unusual. Distrust and suspicion are ingrained in the native mind, and form a bar to any attempt to ameliorate their condition.

EDITORIAL NOTES.

An article appeared some months since in the *Albany Cultivator* stating it to be a fact established by "numerous carefully conducted experiments by reliable persons," that one quart of the milk of the Jersey cow produces as much cream or butter as four quarts of the poor ordinary kind.

Even manure does not escape adulteration. Guano is the name given to a substance found in considerable quantities on certain parts of the shores of Africa and South America, much frequented by sea fowl. It is composed principally of the excrements of these birds, and forms a valuable manure. Numerous analyses have lately shown that in Peru this manure is being adulterated with clay, plaster of Paris, ochre, and inferior phosphatic guanos, to the extent of as much as from 30 to 60 per cent.

Under the heading "Heavy growth a protection against drought," E. J., in the *Albany Country Gentleman*, writes to prove that when fields are so thickly sown that the leaves and branches form an impenetrable shade, the evaporation of moisture from the ground will be hindered, and also the escape of fertilizing gases. The correspondent bases his theory mostly on the thriving and moist condition of a piece of thickly-sown clover, during several weeks of dry weather, which withered the grass and early-sown grains in an adjoining field. The idea sounds plausible, but manifestly can hold good only when the drought is not of long continuance. And the advantage of saving the moisture in the ground during an occasional and temporary drought would poorly compensate for the many enormous evils inseparable from thick sowing.

A writer in *Hearth and Home* recommends mixing Cayenne and other pepper with the food of fowls, and asserts that wild fowls season their diet with pungent and spicy leaves and buds. Audubon is mentioned as stating this to be a habit of the wild turkey. We require to go no further than to our gardens to see what a taste domestic poultry have for aromatic herbs. The same writer also recommends salt, which however is only one of several mineral substances which fowls greedily seek after whenever they are allowed to run loose.

Further on the article in question says "As all birds that live principally upon the ground swallow much earth with their food, it probably aids digestion; and some recommend that the chicken dough should be thrown upon the ground. If upon a fresh spot of earth, we have no objection." This is an original way of putting the well-known fact that all birds which feed on grains and seeds —sparrows as much as fowls—pick up and swallow fine gravel, because without that in their gizzards they cannot easily digest their food. The ostrich, as everybody knows, does not take unkindly to a pestle and mortar for this purpose.

A Master Mariner has written as follows in the *Farmer's Journal*:—

"I have conveyed my butter to the East Indies and back, perfectly sweet, and have crossed the line four times with the same butter on board, and the last year it was as sweet and nice as the first after packing. First see that your buttermilk is well-worked out. Then pack in 12 lbs. oak kegs perfectly. Then pack your kegs in an oak barrel, and keep the kegs covered with brine made from Turk's Island salt. Keep them under the brine with a weight. In one year after, if good butter is put in, good and sweet butter will come out. To a ½ lb. of lime, slaked with one gallon of water, add a handful of salt. Place the eggs in a jar with the small end downward, and when the mixture is cold, pour it over them. Eggs preserved in this way are not so good for cake-making, as the whites become thin and are difficult to froth; but they answer every other purpose, and may be kept indefinitely."

The Americans seem never to be happy, unless they are inventing. Farmers have hitherto had no recourse but the laborious and costly use of the measuring rod and tape, from the most uncertain estimates of the quantity of seed and manure, or the length of fence, required for their fields.

Mr. William Hull, of Hilltop, in the United States, has solved the difficulty. A huge pair of compasses, wielded by the right hand, besides serving many of the purposes of a walking-stick, will enable every farmer to measure the ground he traverses in the course of his morning walk. A scarcely less ingenious inventor improves upon this. He proposes driving a wheel of one rod circumference before you by means of two handles fastened to the two ends of the axis.

To ensure walking in a straight line, it is suggested to select two objects in the line of progress, and to keep the nearer one steadily between the further one and the eye. The other eye, we fancy, is to be employed counting the revolutions of the wheel.

From the following paragraph in the *Journal of the Society of Arts*, it would appear that a varnish exceeding in value any at present obtainable in the market still remains to be adopted by the civilized world:—

Among the raw-stuffs sent by Dr. Von Scherzer from Pekin, was one called schio-lies, a kind of varnish which is employed for varnishing all kinds of wooden things, and has the property of making these articles water-tight. Dr. Von Scherzer has

seen wooden chests in Pekin which have been over Siberia to St. Petersburg and back, and still remain sound and water-tight. Even baskets of straw used for the transport of oil are, by means of this varnish, made perfectly fit for the purpose. Pasteboard, by its use, becomes, both in appearance and firmness, like wood. Most exposed wood-work is coated with schio-lias, which gives it an ugly red appearance, but it gains in durability

This varnish was examined by the Australian Agricultural Department, and Dr. Von Scherzer's communication was fully corroborated. The "Wiener Gewerberrein" also made trials with it. By mixing together three parts of fresh, beaten, defibrinated blood, four parts of slaked lime, and some alum, a thin, sticky mass is obtained, which is immediately ready for use. Articles which are required to be particularly water-tight are varnished twice or at most three times by the Chinese. In Europe, this varnish is not yet made, although it is one of the surest and best ways of making wooden articles perfectly water-tight.

Mr. Mechi, whom we have quoted in several of our late numbers, has made some valuable observations upon the green food of cattle, and upon thick sowing. On the former subject he says:—

"The longer I farm the more I am convinced that the turning "out and roaming-at-large system will come to an end, especially "as land gets scarcer and dearer. It is cheaper and better to bring "the food to the animal than the animal to the food; because in "the latter case he is permitted to trample upon it, excrete upon "it, and lie upon it. One of the largest and most successful farm-"ers that I know has always folded his sheep, and cut the grass "for them—one man, a lad, and a horse chaff-cutter being on the "field, there feeding the sheep with green grass chaff, mixed with "cakes, &c."

Thick sowing, Mr. Mechi believes, to be a great cause of mildew, which kills and rots the plants. He says "The densely packed "mass of plants, weak below, tumbles down flat, or twisted in "various directions by winds and thunderstorms, and thatches the "earth; so that, while rain can pass through the thatch, the wet "earth is shaded from the action of the sun and air, and becomes in "the like condition to a dark and damp cellar, where, we all know, "mildew and fungi flourish." Mr. Mechi is fully alive to the importance of having among crops "a free circulation of air *and light*, and a free evaporation of moisture from the earth." This suggests a distinction that is too often overlooked in connecting malaria with vegetation.

The following interesting and suggestive account of a visit to a Hungarian Dairy appears in the *Chicago Post* under the signature of C. W. Marsh:—

We went out east to Perth to look over the farm of a gentleman who, it is said, has the finest lot of cows in Hungary. We found about sixty head of really splendid cattle of mixed Holland and Swiss breeds, very large and smooth-skinned, admirably kept in stables so clean and airy that we had fully anticipated and were prepared to relish the excellent cold milk which was presented to us for refreshment. These cows are not pastured, that is, they do not depend on pasturage, although they are allowed sufficient run for exercise and health. Their food consisted of cut straw, Hungarian grass, and "bran mash." The stables were furnished with straw cutting and steaming apparatus on quite an extensive scale, everything indicating a high degree of order and economy. The native Hungarian cattle are of a light dun colour, in shape and appearance much like our Texan cattle, with like immense horns. As we came down the Danube we passed very many large droves of them, drinking or bathing at the shores. They were very interesting in appearance, particularly as they are all of a colour, in this more resembling wild than domestic animals. Upon the farm referred to are raised chiefly rye and Indian corn, with Hungarian grass and vegetables for the stock.

The following paragraph is from an American paper. Doubtless there are not a few who could give valuable facts and statistics relative to the breeding of sheep and cattle in this country, where droughts are so frequent and so extensive. Measures calculated to counteract the evils of a sudden want of pasture are important enough to require deliberation. In a place with so many natural advantages as India, surely famines ought not to stand in the way of stock-breeding:—

The very frequent droughts which occur in California seem to exert an unfavourable influence on cattle-raising in the sections thus affected. There are now in the State 637,000 head of cattle, although there were 650,000 in 1863, and 500,000 in 1843. The loss of cows from the drought has been considerable. In 1850, 70,000 cows died in Los Angeles country, and in 1863 and 1864 the loss in the State is estimated at from 200,000 to 300,000. In some branches on the southern coast, seventy-five per cent. of the stock perished. Sheep, however, fare better in drought, getting more food from poor land, and, as a general thing, being provided with more extensive pastures. Since 1845, attention has been turned to the breeding of fine-woolled sheep in California, and this year there are about four millions of these animals in the State. It is estimated that the wool crop of 1871 will be worth over five millions of dollars in gold. Farmers report that they can raise wool for 10 cents a lb., and as it now sells for from 25 to 30, it can be readily seen that the profits from sheep culture are likely to prove much greater than from stock-breeding, wherever the prolonged droughts are likely to occur.

NOTES FROM CONTEMPORARIES.

The *Travancore Gazette* contains the following report upon the quality of the tea grown at the Peermade Hills. The report is dated 15th Nov. 1871, and is addressed to Mr. Crawford, the Commercial Office, Alleppey:—

"We to-day received a report on the samples of tea sent to Russia, which is highly favourable. The tea is well liked, and an order was sent for 150 half boxes of same at 2s. per lb. Should you determine to send over next season's crop, you should ship in boxes of 50 to 60 lbs., and put it up in the same sort of packages in which Assam tea is usually packed.

"The tea is reported on from Russia as very nicely got up, and right in every respect as to colour, firing, &c.; therefore we would advise that no alteration be made in the manipulation.

"Green Indian teas are coming more into use, and fetching higher prices than formerly."

There is strong encouragement here to the Neilgherry planters. A report upon Indian tea, so favourable in all respects, we do not remember to have before seen.—*Indian Statesman.*

The effects of last years' deficient rainfall are making themselves severely felt, we are sorry to see, in Guzerat. The scarcity of fodder is pressing heavily on the people, the rain that fell a fortnight since having been insufficient to produce much effect. But the want of drinking water, as is frequent in such cases, is the most alarming symptom of the distress. The rivers, however flooded in the rainy season, are a precarious source of supply when the dry weather sets in, and the Nerbudda has already subsided to such an extent that its water is becoming disagreeably salt from the tides. It is mortifying to reflect that, filled before the river failed (and this was not till after all reasonable expectation of rain was gone) the capacious reservior at Broach would have afforded a plentiful supply of pure water. The consequences of the neglect of this provision forces upon us the necessity of not depending altogether upon the rainfall when it is possible to store a supply of water. The rainfall in Guzerat, last season, was not more than two-thirds the usual amount.—*Id.*

Many of our readers have doubtless observed with interest and surprise Mr. Login's Report of certain experiments conducted by him in the Punjab, with the view of testing the expediency of introducing into this country the Egyptian system of cotton cultivation. Mr. Login describes his operations and their results with great care, and at considerable length. Considering the pains-taking manner in which he has conducted his experiments, and the anxiety he seems to have felt lest he might draw too hasty inferences, we should think ourselves justified in accepting as decisive Mr. Login's simple statement that the introduction of the Egyptian system would be an improvement the value of

which it would be hard to exaggerate. But Mr. Login has demonstrated the reasonableness of his belief by a collection of facts which seem to us to prove conclusively that, profitable as the present methods of cotton cultivation may be, a system that gives us great bushes five feet in height, literally covered with pods, sometimes as many as 300, will be more remunerative still. Remarking that the land for these experiments was granted free of rent, Mr. Login calculates—he gives the figures—that there will be a net profit to the cultivator of 250 per cent., and then adds, "surprising as these figures may appear, they are not more so than seeing the field itself, and they prove to my mind, if I ever had any doubts, that India can and will compete with the world in the produce of this great staple of industry."

The people appear to have been enthusiastic in their admiration of these wonderful results, and profess themselves of full purpose to try the new system on an effective scale next year. The chief points in Mr. Login's plan are, 1st, thin sowing; one plant, it would seem, for ten or fifteen on the native system. 2nd, careful cultivation; *i. e.*, deep and repeated ploughing, followed by abundant manuring and watering, and frequent weeding. It is gratifying to learn that the zemindars noticed, and seemed to appreciate, this attention to the fields.—*Id.*

THE *Agricultural Gazette of India* for November contained an inquiry from the Hon'ble Mr. Capron, the Commissioner of Agriculture at Washington, as to whether the sugar-cane ever matured its seeds in the East Indies. A late number of the *Sugar-cane* (Manchester) contains a most interesting article on the subject by a Dr. Vinson. The sugar-cane, he tells us, is purely the creation of man; it has no botanical existence. As the Arab or English thorough-bred from the ignoble wild horse, the pointer from the wolf-dog, and the canary from a green Chinese bird, so by the unremitting labour of successive generations, the thick-stemmed and juicy sugar-cane has been developed out of some grass, doubtless quite common and well known to botanists. "But animals do not, like vegetables, lose the faculty of reproduction. This is distinctive of animals; but they may become less prolific, or even sterile, when their form is improved by cross-breeding. It is in this manner, no doubt, that our finest roses, so rich in colour, so full of petals, of such great size, and of such various appearances, and so odoriferous, have descended from the simple briar.*** Has not wheat been a creation of the same kind, only that the art has been applied in an opposite direction? In the cane the seed disappeared to the advantage of the stalk, but in wheat the stalk has vanished for the development of the seed."

The Editor adds a note to the effect that sugar-cane seeds have been sent to England from Barbadoes, and sown in hot-houses, some at Kew, but with what success is not known.—*Id.*

SOME idea of the enormous number of horned cattle in the Ganges Valley, may be formed by a perusal of the export returns of hides from Calcutta for the present year.

During the first eleven months of 1871 nearly *six millions* of hides were sent to Great Britain, Foreign Europe, and America; being a greater number than were ever before exported in an equal period. When it is remembered that this quantity represents only the surplus stock that is left over from the Bengal Presidency after the wants of the entire native community have been supplied, we may safely assume that the total number of cattle equals, if it does not exceed, that of human beings in this part of India.

There are probably *one hundred millions* of horned beasts to be found between the Sutlej and Calcutta, a number which probably does not exist anywhere else on the globe, except perhaps in the Pampas of South America.

We observe that although the prairies of North America are said to abound with herds of wild buffalo, she nevertheless imports buffalo hides from India to a greater extent than any other country in the world; in short it may be said that in regard to buffalo hides, and sheep and goat skins, America is not only India's best customer, but her only one; the exports to other countries being less than 2 per cent. of the total quantity sent out.

A more striking proof of the fertility of the Ganges Valley could not be given than the fact that, with a population per square mile greater than that of most European countries, it nevertheless supports a larger number of cattle than is perhaps to be found in the whole of Europe, and exports besides a million tons of raw produce annually for the use of the rest of the world.

Can it be doubted that when India's agricultural resources are fully developed they will prove as astounding as the mineral resources of England are at the present moment.—*Delhi Gazette.*

AGRICULTURAL STOCK.

SHEEP-BREEDING EXPERIMENTS.

NORTH-WESTERN PROVINCES.

From Major W. C. Macdougal, Deputy Superintendent of Studs, North-Western Provinces: to W. Oldham, Esq., L.L.D., Magistrate and Collector of Ghazeepore, dated Hauppur, the 20th August 1871.

IN reply to your docket No. 308, dated 14th ultimo, I have to remark with regard to the Hissar-bred rams. *Hissar rams* appeared to be a cross between the imported Leicester and Hissar district ewes. The objections to the rams, in my opinion, were that they seemed too large and coarse narrow in the chest, flat sided, too long in the legs, did not possess fattening qualities, shewing more of the Hissar than the Leicester. I have a great objection to the Hissar country sheep, they seldom live out of their own districts, they will not thrive at Hauppur, and they die at Saharunpore, in fact they will not stand crossing the Jumna. I consider the rams ill-adapted for the ewes of Ghazeepore; the sheep of the district are as a class well bred, small, compact, and may be considered a useful breed. The ram, to suit the Ghazeepore breed of sheep, should be stout, compact, stout-legged, well bred and small; large animals are a great mistake, owing to the difficulty in finding food for them. The wool of the Hissar rams was very fair in the one cross, the hair of the native breed had disappeared; and wool was produced; how long this improvement would last, if not properly fed, I do not know. I believe that, with the village system of keeping sheep, the wool would disappear, and hair be reproduced. The Hissar rams did not fill the ewes in the same proportion that native rams might have been expected, still the return from the Hissar rams was not disappointing.

Stock by Hissar Rams.

The lambs by the Hissar rams were very much larger than the produce usually obtained from the district ewes. My ewes were good, but of the common Ghazeepore breed. The lambs appeared coarse, with large joints and promised to grow into big sheep—this latter change, as regards size, is not, in my opinion, an advantage; the lambs inherited the defects of the Hissar rams and showed a good deal of the native Hissar breed, the lambs were nearly all white: there was a remarkable improvement in the wool, which appeared to be very different to the native stock of the same age, in thickness and texture. The lambs and ewes with me were well fed, getting mote, bhoos, and chopped cut in straw, with what grass and leaves they could pick up in a large compound; besides this the lambs had a small quantity of parched barley. They were first-rate on the table, and their quality of size was of course for killing of great advantage; but for rearing on bad fare, size would always be against them. I offered a number of the lambs away to the shepherds for the neighbourhood, but they were invariably refused on account of the lambs being "bulaitee janwars," and would require as much food as a pony: the village fare would, they stated, soon ruin such animals. On leaving the district in February last, I offered my flock to several officers for what they cost, but finding no European willing to take them, I disposed of them to natives, as I thought this the best plan to ensure the breed getting into the district. I directed two lambs from my ewes to be sent to you with the Hissar rams, but in the hurry of leaving Koruntadeah, I am not quite certain whether the lambs were ever dispatched. To enable the stock from the Hissar-bred rams to come to any sort of perfection, they require to be well fed; and likewise the ewes, if not supplied with sufficient nourishment, the stock would be woolly, narrow, and even worse than the native sheep, because less likely to undergo hardships. I had not the opportunity of judging what the lambs would be at an advanced age, but as a trial I consider the Hissar-bred rams a success: (much more might be expected from rams better suited to the district ewes); however increased size and improvement in wool was established, with good feeding of parent stock and the lambs: these qualities were apparent, but with poor food the result would have been different.

Remarks upon Sheep.

It is useless to try great extremes in breeding. To introduce changes into any breed, the alteration must be gradual, consequently slow, climate must be considered. I conceive it to be a great mistake to put a ram with blood of the native Hissar sheep in him to the Ghazeepore ewes or to any ewes of a small breed. Hissar sheep are as unlike the sheep of Ghazeepore as can well be conceived. If the English well-bred and small ram could be put to the Ghazeepore ewes, a good breed would be obtained, likely to suit the district. With the Hissar-bred rams, I sent you a young ram given me by Mr. MacNamarra of Arrah, being a cross from an English ram out of a common Arrah-bred ewe; this lamb was handsome, showed blood, was compact and small, and would, I thought, have proved useful and adapted for the Ghazeepore breed of sheep. Unfortunately when I got this lamb, he had been starved and was only just recovering when I sent him to you with the Hissar rams, which I returned in February last. I have a high opinion of the Indian breeds of sheep; I consider them wonderful animals. Neglected, starved, exposed to all seasons, it is a matter of astonishment to me how they can exist. Still if these sheep, emaciated and wretched in condition, are allowed to pick up what they can get about a compound, with a small quantity of bhoosah and small amount of salt for about two months, and then put upon gram and chaff for six months, they prove how easily they fatten, all the mutton is good, nourishing and fat, though small. With the advantages of nourishing and suitable shelter, I am very sanguine that great improvement in the Indian breeds of sheep could be established but nothing can be of much good so long as the sheep suffer from the existing difficulties.

The native breed is better capable of undergoing the starvation and exposure than any description of sheep which could be introduced. Sheep with an English cross would be worse than the pure native breeds, if left to undergo the hardships of Indian village treatment.

I believe with proper food, care and shelter, sheep might be improved in India to rival the best breeds, but whether the expense would remunerate the breeder is another question. In proof of my opinion that Indian sheep are a valuable breed, I would mention that when returning to India in 1863, I became acquainted with a number of Australian gentlemen, who lent me books on the colonies. I remarked that in several of these works it was mentioned that ewes had been imported into Australia from India, and upon enquiry I found that my friends from the colonies were well aware that Indian sheep had been bred from and had done well in Australia.

It is strange how peculiar sites in a locality suit sheep; sheep will do well upon one spot, when a few yards distance would cause certain loss to the breeder, both places looking exactly the same. I once forced my shepherd to keep my flock upon a site which I considered very suitable for sheep, being high with good shelter; the old shepherd warned me that the place would not be healthy, but I insisted that the flock should remain in the place I had selected: very shortly afterwards the sheep began to sicken, and after losing about a dozen or more, I was glad to remove the flock to a place recognized as a favourable site and recommended by the old shepherd, although I would not build a house and kept the sheep in the open, still the sheep soon recovered and did well. The despised native cultivator with all his ascribed ignorance, makes good use of the village flocks; ploughing well the land intended for sugar-cane and other valuable crops, he induces the shepherd to allow the sheep to remain during the night upon his field; long before the sun is up, he ploughs the droppings, hair, and grease into his land and gains a rich manure.

Difficulties of improvement.

It is useless to breed sheep with care and expense to turn valuable animals adrift on the same terms as our village flocks. It would be difficult to introduce any breed to exist upon bad fare and contend against all the drawbacks of climate, hard usage, and starvation better than the common breeds seen in every district. When it is considered how the sheep fare, the distance they have to travel daily to collect what will just support life, that the flocks are allowed to eat the filth about the villages, and that the shelter is in keeping with their food, that the shepherd is the poorest of the village community, and that to rear up his own children he has to milk the ewes as regularly as the cows of the village, the only wonder to me is how the breed of Indian sheep is ever at all maintained. *In conclusion* if it is the wish of the Commissioner to introduce rams into the district by breeding them within the Benares districts, or to go into the matter of improving the breed of sheep any further, I will be glad to supply information, if such be required, as I think a fair trial could be made without much expense or trouble.

THE INDIAN POULTRY YARD.

Geese sit admirably on their eggs, and are very careful of their young. Like the turkey chicks, and for the same reason, the little goslings should be kept separate from the mother, under a partly-shaded fowl-cage, on a nice spot covered with fine "Hureealee" grass, and clean good water, in which a little very fine sifted rice tour has been mixed, given to them in a shallow saucer, several times a day. As the goslings will almost immediately commence to crop the fine grass, which is their natural food, they require nothing else beside this thin mixture of good water and fine tour; and it is surprising to see how well they thrive on this simple but natural treatment. They should, however, be let loose with the mother for an hour, morning and evening, for the purpose of grazing, accompanied by a boy with a long switch, to keep away the kites and ravens. After a time, when they begin to grow perceptibly, the tour and water should be gradually thickened, and eventually a little boiled "cumboo" mixed with it by degrees. They should be fed on this till they are six months old, when they will be found to be strong and healthy, and quite able to take care of themselves. During the nights they should always be shut up with the mother, under a large basket with fresh dry earth sprinkled underneath it. Coarse paddy thrown into a earthen basin of water, is the best food for geese but they will eat "cumboo" "cholum," and "ragee" given in the same way; and in order to thrive well they should have water to swim and frolic in, and a plot of nice grass to feed on daily.

Domestic ducks are very bad mothers, and appear to care nothing for their eggs, which they lay at night anywhere in the fowlhouse. It is necessary therefore that their eggs should be set under a hen which, as they are very little larger than her own eggs, manages to hatch them very well, and takes great care of her adopted children. Ducklings are hardy, and grow up very rapidly if properly treated. For the first week they should be allowed to remain with their foster-mother under a fowl cage partly shaded, and placed on clean, sandy, dry ground, and fed with a mixture of fine tour and water. When they begin to run about pretty well, they should be put into an inclosure, in which there is a small cistern with sloping sides, to enable the ducklings to get into the water and out again readily. The hens should then be kept under separate cages round this cistern, and the cages should be made with openings, sufficiently large, to admit of the ducklings running in and out, without enabling the hens to do so too. This inclosure should be covered over with open bamboo work to keep off the kites and ravens. In this place they should be kept all day, partially shaded from the sun and rain, and fed once a day with earth worms, besides getting their fine tour and water. The fine weeds, which grow in tanks and canals, afford them also great nourishment, and should be dropped into the cistern daily with the fresh water that is put into it. At night, cover up the ducklings, with the hen, under a large basket, with dry earth sprinkled under it, and renew this every night. After they are three months old, begin to mix a little boiled "cumboo" with their tour and water. Continue this treatment till they are six months old, from which time they can be fed in the same way as the full-grown ducks are. This should be a mixture of fine tour, and boiled "cumboo," or rice with water, for the morning meal; and either coarse paddy, "cumboo," or "ragee" thrown into a pan of water, for the evening one. They should always have lots of water to dabble in, and they thrive remarkably well in weedy tanks.

In breeding fowls, for useful purposes, one should not choose among the "asul," or through game birds, because such a hen not only lays a small number of eggs, but she is a careless, clumsy, and a fiery mother, frequently killing her own young, if another hen should approach her and her brood. She is very inapt also during the process of incubation, and very frequently breaks her own eggs in consequence. The little chickens also of this breed begin to fight among themselves, even before they are fledged, and not unfrequently kill each other. On this account we should recommend the breeder to select fowls of caste between the "asul" cock and large parish hens. Fowls of this breed are called by the natives "doaq-la," and they grow to a much larger size than the real game fowl does: some young cocks, when only a year old, have been known to attain to a weight of twelve pounds, while their mother weighed only eight. On account of the great weight of such hens, their eggs had better be placed under large, feathery, pariah hens, as these are more careful mothers, and rear their young very tenderly and well; the abundance of feathers nature has provided them with, enabling them to do this readily. The eggs which are collected daily, should be placed on fine, clean sand, in a shallow box *without a lid*, and turned over every day till the hens have finished laying. They should then—that is, the eggs of the same fowl—be put under a hen to hatch. Small wooden tubs, of about fifteen inches in diameter and six inches deep, make the best nests, and last as long as one could wish. A quantity of dry ashes should be put into the tubs at first—this helps to keep

away remain—and then they should be nearly filled with clean paddy straw, well crumpled to make it soft. These nests should be placed as far apart from each other as possible, in order to prevent the incubating hens from disturbing one another; and they should be fixed about three or four feet above the floor of the fowl house, which should be sprinkled daily with clean dry sand, or earth, and well swept in the mornings. The chickens should, on no account, be taken down as soon as they are hatched, but allowed to remain in the nest for a day or two, until the hen shows signs of wishing to get down. They should then be removed gently in a basket, and put with the mother, under a partly shaded fowl-cage, on a clean dry spot in the sun. For the first week they should not be put out before sunrise. At first they should be fed on "rolong," that is broken rice, sprinkled under the cage, and a little good clean water given to them in a small, shallow, earthen saucer. If a hard-boiled egg, in addition, were given to each brood every day, the chickens would thrive very much on it. It should be given chopped fine with a single clove of garlic. They should also be well fed on white-ants after they are a week old. A sufficient quantity of paddy should be thrown under the cage, twice a day for the hen; and the chickens should be fed three times a day, at the least, with the "rolong," while the white-ants should be given in the morning, and the chopped egg and garlic in the evening. If this treatment were continued for three months, the chickens would be found to be healthy, strong, and large. It would be of much advantage to let them loose with the mother after they are a fortnight old, into an inclosure covered over with bamboo work, or with a coarse net, to keep the kites and ravens off. At night they should be covered with the hen, under a basket, on a clean dry spot, on which a little dry earth has been sprinkled. As soon as they become too large for the kite to carry away, let them loose, and allow them to roam about the grounds. They can now be fed with fine tour, in which a little boiled "cumboo" or rice is mixed, as well as with paddy. Fowls should be fed with an admixture of the following grains, paddy, "cholum," "cumboo," and "ragee;" and their houses should be very clean, airy, and dry. Those who follow this plan will soon find their fowls to weigh eight and twelve pounds.

The breeding of pigeons, for domestic purposes, is not a difficult affair: and as they multiply very rapidly, and can fly to a distance to feed, it becomes a profitable one. The principal points to be attended to are, to have a properly constructed dove-cote: to feed them with an admixture of various kinds of grain; and to keep always some rock salt in the dove-cote. If this is done, pigeons will never leave their houses, and fly away to other places. The dove-cote, whether of masonry or of wood—the former is preferable—should be so constructed as to have the nests arranged in pairs, in such a manner, as to have each pair separated from another, because pigeons breed so fast, that they require a second nest, close by, to lay again before their young are fit to fly. If they have not this second nest, they lay their eggs in that in which their young are, where the mother is prevented from sitting on them by their presence. If they have a second nest at hand they lay in it, and both the male and female birds take it in turns to incubate, and also to feed their unfledged young till they are able to fly away. At this time the old nest should be well cleaned out. The best nests for pigeons are chatty pots, built into the wall, on their sides, with their mouths even with the face of the wall, and a ridge should run along just below these openings, to admit of the pigeons alighting on it before they enter the nests. Dove-cotes should have but one entrance for the birds, and that at the top, to prevent ravens, &c., from getting into them, and molesting the pigeons. A door should be furnished below, to allow a man to enter and clean them out daily. Pigeons delight to feed on various kinds of grain, and they thrive better, and breed faster if this is attended to. They are fond of the following grains: paddy, green gram, horsegram, "cholum," "cumboo," and "ragee," which should be given them mixed, and sprinkled on a hard spot of ground near their house. Good fresh water should always be easily accessible to them, because they drink every time they take a crop full of food for their little ones.—*Madras Times.*

The following remarks are by "G," in the *Farmer*. How common it is to see a fine horse seriously injured by native farriers who pare and rasp away at the foot till the poor animal has hardly anything to stand upon! And how often is the injured horse altogether destroyed by the reckless adoption of native remedies, suggested in many cases, by the sapient ghorawalla:—

There is much to be advanced in reference to the hereditary nature of sidebones. As an item in the lengthy list of points to be avoided in the selection of animals for breeding, they form one of the most important, and by such observance in a great measure their occurrence would be much less frequent. We now purpose to consider the common and exciting causes of sidebones, avoiding the arguments and speculation in reference to hereditary question for a more convenient opportunity. In our last, we briefly cited the facts and conditions which confer upon the limbs of the horse the wonderful powers of adapting themselves under trying circumstances and rapid movements. They are perfect in health, but by man's interference and carelessness, as well as brutality sometimes, those powers are subverted or perverted. We remarked, in addition, that the hoof estimated and preserved as nature had originally designed it—a protection and support—the communication of jar, or concussion, is impossible; but cut and rasp it away and it then ceases to support and protect. The sensitive parts are brought nearer to the ground, and pressure from stones, the shoe, nails, &c., operate very forcibly. The circulation is altogether interfered with, and a proneness to inflammation ensued. Parts hitherto united, and preserving relationship in the performance of functions, are now disturbed by the institution of motion between them, and pain results. Thus, when the heels are lowered too much, and the frog pared or neatly dressed up, the wings of the coffin-bone, which are prolonged backwards by means of cartilage, to mitigate or absorb concussion, receive an unnatural amount of pressure, and are caused to undergo needless motion. They then become, first, simply irritated, and tenderness merely is present, but this increases as the case is prolonged in its application, and becomes pain and inflammation. The sound, strong, healthy foot, would either prevent these states, or, in the case of hereditary predisposition, delay their appearance for a much longer time; but being reduced to a condition inadequate for its purposes—even the weight of the animal standing induces disease—it recedes and assumes an alteration of form, to the detriment of the parts within. As cartilage, like all other parts of the body, cannot have inflammatory action going on within its substance, without undergoing change of structure, that which prolongs the coffin-bone into the angles of the heels being no exception when so affected, eventually becomes bone. It will be now readily understood, that such a change being secured, the former elasticity will be gone; the rough surface of bones which now come together, do not favour ease of motion. Stiffness is the consequence, and not uncommonly the point is permanently destroyed. The prevention of sidebones is mainly secured by adopting proper rules of shoeing and preserving the feet. We defer their enumeration just now, and briefly detail the usual plan of remedial treatment.

Firing is a cruel measure, and we have discarded it long ago as highly improper: also blisters frequently aggravate the inflammation, and cause an extension of the ossification. Rest is the most appropriate thing to be observed first, and next promote the growth of the hoof, by means of foot ointments regularly applied. A little cooling medicine is very useful, and the diet should be laxative: while a large box, well littered with sawdust or chaff, with straw above, is allowed where the animal may remain in quietude. The use of an anodyne liniment may be directed round the coronets, two or three times a week, and, alternating with them, fomentations by means of flannel bandages, wrung out of hot water and bound around, will be found serviceable. These should remain on until dry, after the process has been conducted, say half-an-hour. When the shoes are applied, which may be done in about a month, care must be observed to take the pressure from the heels by means of a bar shoe, and place it upon the frog. The animal should be put to very slow work at first, and, by degrees, as the foot acquires greater strength and protection, the diseased parts having lost their previous pain and tenderness, the heels may again receive the weight, and the horse be enabled to perform heavy, but slow work, with ease for years. With this treatment, a horse in our possession has been restored, and now draws a carriage over the stones without signs of pain or lameness.

THE COCOANUT TREE AND ITS CULTIVATION.

(Concluded from our last.)

If the *soil* at the foot become *too rich*, the larva of a beetle a large grub with a reddish brown head, soon finds its way to the roots and into the stem, hence though the foot of the tree may enlarge, the stem does not develop itself, the new leaf spike at the crown becomes yellow, fades, and is not replaced, nor does it open out into the usual frond, and in two or three months, sometimes a little longer, the whole tree top is affected and drops down piecemeal to the ground. It would appear that fear of this evil is the reason that ashes *alone* are recommended by so many cultivators.

As soon as the *new fronds have divided* into the long side leaflets or lost their connected form, which is at the end of the first year, the soil should be dug up and ashes applied about once a month. When the tree is *two years* old, and henceforward at the commencement of every monsoon in May and June, the whole of the soil, a yard or two round the stem, should be

opened out and ashes with dry manure applied and left open to the air; and in October when the rains have ceased this freshened earth should be replaced and levelled. As the tree gets older and the depression at the foot is gradually filled up, it may not in after years be necessary to dig so deep as for the earlier growths. If the opening out of the roots and manuring be thus *annually* attended to, the tendency to form a sort of bulb on the surface, and throw roots above the soil will be checked, the old worn-out rootlets are cut away, strong roots from other trees and all weeds are removed, and the process acts both as "a wintering and pruning" as recommended by scientific gardeners in Europe to productions of their own gardens.

Cattle are most destructive the first two years in eating off the ends of the fronds and stripping the leaflets, if the plants suffer often in this way, the growth is entirely stopped, sometimes the new spike leaf is pulled out when the tree dies. Should the heart of the stem and top not be injured, still the tree will remain an unsightly object, and often entirely profitless and barren.

From the time that the leaflets become fully developed and distinct from each other, till the time that the spatha (or covers to the flower) make their appearance, the fronds should be shaken and weighed or pressed downwards each month, so as to keep them from each other and make them spread, and careful examination should be made lest rats, beetles, or worms have made nests upon the head or bored into the cabbage heart of the cocoa, and this often. Some planters sprinkle ash and salt about the spike shoots to keep insects away. The dried fronds, old spatha, fruit and blossom stalks, and ragged fibres should be removed at stated periods of perhaps a month, or so often as the nuts may hereafter be gathered. The application of salt and ashes to the tree tops is usual at *least* in March and October to keep off the swarms of insects, particularly red-ants which live upon the juices of the tree and render them fruitless.

The cocoanut tree is at all periods of its life endangered by the attacks of enemies, while one beetle bores into the tender shooting leaf, and lays its eggs there, to be hatched into grubs which will eat their way in all directions. Another will bore round holes into the stem itself and live there, rats climb up and have their nests in the hollows of the branching fronds, and eat the cabbage itself or feast upon the young kernels. The common *flying fox* or Rousette (Pteropus) gnaws round holes through husk and shell of the mature cocoanut, and will attack the young cocoanut, biting away large pieces from the tender part under the capsule, and burying its head in the nut, will revel in the sweets within. The *flying squirrel* (Pteromys) will also make his abode in some cocoanut topes near woods or forest trees, and at nightfall attack the nuts, and two or three dozen may be picked up every morning with the marks of his teeth upon them, or partly destroyed. The common striped palm squirrel is also sometimes found destroying the nuts and blossom—while red-ants and parrots attack the blossoms only. The only method of obviating these evils is to shoot the flying foxes and squirrels by moonlight, to use arsenic with grated cocoanut pulp, or pounded glass, oil, and black sugar mixed in cocoanut shells, left in the tree tops. In one plantation of about 15,000 trees, six to seven hundred rats were taken month after month in trap falls. The red-ant's nests should be sought out and destroyed. A large wasp will attack the very small nut, taking it for the material of their nests. Beside using ashes sprinkled often with salt between the fronds, *some natives* place onions, garlic, or even assafœtida and fenugreek there, thinking the scent would keep off beetles and grubs. When the spatha is cut for drawing toddy, the frequent visits of the men will tend to keep other intruders away, but the smell of the toddy is said to invite rats and toddy cats. If any of the extracted juice falls from the receiving vessel on to the young spike or leaf, it is said to cause it to decay by attracting insects to bore into the fronds. Grass should be kept down by feeding off with goats and cattle. In marshy lands cattle are apt to make deep tracks and break down the margins of the terraces, hence goats or calves only are allowed, and the undergrowth is sold to be annually cut for the repairs of paddy fields, and this is another source of profit.

Planting jack, mango, tamarind, punna, coffee, and other trees, as is often done close to the cocoanut tree, is thought to be detrimental, as also allowing the pepper and betel vine to climb the tree, or even the sowing of gram, maize, or any of the dry pulses under the shade.

But areca-nut trees may be planted as all other palms, and the ground may be dug, and all kinds of yams and tuberous roots cultivated with advantage.

If the instructions given are followed, distinct leaflets will begin to show themselves at the end of the first year, and be completed at the end of the second; on each frond which will be 3 inches thick in the stem or leaf stalk next the *parent* trunk. In the 3rd year the bottom of the frond will assume somewhat the form of a horse shoe where it clasps the main tree, and in the fourth year the trunk of the tree will appear slightly above ground, and is then called "a cocoanut tree with the elephant's foot" and will have not less than 12 fronds. About the fifth year the trunk is fully manifested, and there should be about 20 to 24 fronds, and when a luxuriant well-grown tree begins to bear fruit, there will be no less than 36 of these branches or fronds. If a tree receives much attention and is close to a hut or stall for cattle, these processes may be hastened, but on a rocky hill-side they will be much delayed, two or more years being required in addition to each stage.

Spatha (chotta) or shoots from which eventually the flowers are to appear, will begin to make their appearance in the sixth year, but some kinds of cocoa as the Nicobar, even before this, but on some soils seven to fifteen years may pass without the slightest appearance of the spatha. The height of the stems at this important period, in some *kinds* of tree usually, and *in all* when influenced by the soil, will be only a foot or two above the ground; while, in other places, the stem may be sixteen feet high. For the first few months these flower shoots are deceptive and only dry up, but within the year begin to retain their blossoms and bear a few fruit, yielding abundantly in three or four years after their first appearance.

In six months from blossoming, the nuts will have the kernel begin to solidify, and in a year the fruit is fully ripe, even sooner, if the season is very hot and dry.

The produce of the tree in full health and properly tended is yet very much dependant on soil and climate. The average may be put down at 120 nuts in the twelve months, while in a low and sandy soil it will amount to 200; and when planted in gravel and laterate foundations not 60—but the most productive months are from January to June, that is, for ripe nuts, the heat bringing them quickly to maturity.

It is calculated that where the roots of the trees can reach water and the soil is alluvial, the trees will bear from 8 to 10 ounches or crops of fruit, in other and higher lands not more than six.

One hundred cocoanuts perfectly grown and carefully dried will, it is generally calculated, yield when pressed 10 to 13 edangalles, (each containing 92 cubic inches) of oil, (40 nuts to an imperial gallon). Inferior cocoanuts will vary from 3 to 0 edangalies; fruit taken from trees on salt marshes have the least oil.

When the trees begin to show the fruit, shoot, or spatha, it is often thought advisable to extract the juices for toddy and not allow the blossoms to be grown, but this only in the monsoon and for that season only. This is supposed to render the future fruit bunches more numerous and give the sap a tendency to flow. In some places trees are never allowed to bear fruit, but toddy is always extracted. Drawing toddy for a few months is thought to check the habit in some trees of dropping immature fruit, and again of preventing injurious animals and insects from infesting plantations, the frequent visits of the men to the trees being a check to their forming nests and otherwise remaining hid in the tree tops.

Overdrawing of toddy will cause the luxuriant trees to dwindle away and acquire very sickly habits and may make them barren, hence if a tree is allowed to be drawn for toddy for six months, this should not be repeated till another five years at least have elapsed, otherwise they become exhausted and shortlived. Ants, bees, and other creatures are attracted by the sweet toddy, not only should the vessel be protected from them, but the liquid as before noticed should not be spilled over the young leaves.

While certain of the fruit shoots are cut for toddy the others will still produce cocoanuts, as well as those previously developed, but if three or four be used for this purpose, the others will dry away or be of very little use. Even when a spatha is partly used for toddy and left, provided the part containing the buds remain undestroyed, a few fruit may be produced on that stalk.

Five parras of 10 edangalies each of good arrack may be made from a single tree devoted to this purpose during a single year, but some very good trees will give 8 to 10 parras even—this is rare.

Gathering some of the tender cocoanuts from the earlier bunches will develop the *succeeding* bunches greatly, and strengthen the whole tree very naturally. It is not however recommended by some to cut the fruit stems or stalks out, before they are matured and dry, as it causes the tree to bleed and lose its most valuable juices, hence in order to prevent the possibility of injury to the tree, owners will permit none but mature fruit to be taken.

The number of fronds which dry and fall off from a tree is eight or ten in the course of the year, principally in the hot season. It is usual to cut these off but if done too early, those next the one cut is affected and fades; hence only those turning brown should be cut, and that leaving a cole and a half on the tree of the foot stalk. It should be remembered that the drooping leaves are intended to protect the tree stem from the burning sun.

Thirty species of the cocoanut are described and named as in the subjoined list, but cultivation and incidental natural causes

[illegible] with the diversity, and in a few cases there are [illegible]

[illegible]	[illegible]
18. [illegible] do.	[illegible], but large and heavy with thick kernel.
19. [illegible]	The eyes of the fruit are small. But the copra or dried kernel is very full of oil.
20. Male cocoanut.	There is a peculiarity in the fronds and the leaflets do not separate from each other.
21. [illegible] cocoanut. 22. The Island.	Evidently from the Maldives, both the nut and fruit seem reddish.
23. The Portuguese.	The same as above.
24. [illegible] or Ceylon.	Nut large and red, fronds slightly bluish.
25. The Dutch.	Fruit, &c., a red pale colour.
26. The [illegible]	Two fruits only on each bunch, and these dark green.
27. Jaffna cocoanut.	Here again the fruit are large, but few in numbers.
28. [illegible]	The fronds of this tree are pale yellow.
29. The ship cocoanut.	Stem or trunk of the tree, boughs, or leaves are small and all tinted with black spots as if blighted.
30. The Maldive.	The covering of the fruit is of a whitish or washed-out blue.

The red and the black kinds are generally supposed to be the most fruitful, although with care and cultivation of the above described, none need be disappointed in the returns, and this will be in proportion to the labour bestowed.

The trees which live in the most fertile soils will live for a century, other less favoured from 60 to 80 years only; the former will yield their fruit commencing at the 10th year, and with rare intervals continue until their 60th year, and then gradually decrease in fruitfulness till they decay.

RICE CULTIVATION.

◆

MAJOR MAYNE ON RICE CULTIVATION BY IRRIGATION.

(*From the Pioneer.*)

Dear Sir,—I have only lately seen the account of the experiments at the Shameerpett tank, conducted by Major Mayne, R. E., and concerning the conclusions of which I have previously addressed you. I find that the experiments at this tank, though conducted with great care, are not decisive. With reference to the experiments on evaporation, there is nothing to cavil at; but the following points, which have been neglected in the consideration of the amount of water required for the irrigation of rice, appear to me to seriously affect the value of the conclusions drawn.

Firstly.—In para. 10 of his report, Major Mayne, while allowing that any heavy rainfall would have considerably affected the experiments, proceeds to say that a rainfall of 187 inches during the period of cultivation "may be left out (of the calculations) without affecting the results in any material degree." Surely, if it were not to be considered in any other way, at least 187 inches of water, falling on the experimental rice crops, should be added to the actual depth of water expended on the crop; and if we consider besides that the total annual rainfall is 28 inches and that on the gathering ground of the tank this gives a possible collection of 134 millions of cubic yards (para 4), it seems rash to neglect 187 inches, or one-fourteenth, of the annual rainfall. It is true that this 187 inches may not have fallen over the whole gathering ground; but the distribution of the fall should have been ascertained, and the amount of water supplied by it incorporated with the calculations.

Secondly.—"A very petty stream," we are told in para. 10, was at the commencement of the experiments found running into the tank; but Major Mayne has neglected also to notice that. We are told that the bed of the tank was rocky; we may assume the bed of the watercourse was the same. Under such circumstances it is frequently a matter of great difficulty to gauge a small stream of water, and [illegible] all that passes down the [illegible] than was visible [illegible] of this point [illegible] for gauging the stream, [illegible]

[illegible]

having [illegible] into the irrigated lands, should be considered as [illegible]

[illegible] lengthy letter [illegible] ed been considered, the results would have been more in accordance with the [illegible] amount of water required for rice cultivation in other rice-growing countries. In my previous letter, which you were so good as to print, I pointed out that in Spain, Portugal, Italy, and other parts of India, Major Mayne's estimate would be considered too little by at least one-half. The only circumstances in favour of the probability of Major Mayne's experiments giving a better "duty" per cubic foot of water than those usually assumed, are that this experimental rice crop was grown in a comparatively cool climate and at a cool time of the year. The consequence would naturally be that the evaporation, not only in the tank but in the fields, moistened by the waterings from it, would be sensibly diminished and there would not therefore be so frequent a demand for water.

Major Mayne's report is valuable only, therefore, for the actual facts it contains, and these are the rate of evaporation of water in a tank during certain periods, and the quantity of land irrigated from a tank by an amount of water not sufficiently defined.

W. O. R.

GROWTH OF SUGAR.

◆

NEW SOUTH WALES.

The sugar industry is assuming great and permanent proportions. It has passed through a critical stage, and is emerging with honours. In the first instance it seemed necessary to exaggerate the expectations formed of the sugar-cane, in order to get any one to try it and since it was planted until the present year the conditions for testing its worth have been absent; for when the season was good the necessary machinery was absent; and when the machinery arrived, the season was adverse. Although a strong opinion based on physical considerations was expressed from the first concerning the suitability of the crop to this colony, gross ignorance prevailed respecting the treatment of the cane, and the manipulation of the juice. Experience had to be purchased at considerable cost, for many of those who first venture to make sugar, utterly failed in the attempt, and have been obliged to retire from the field. These failures, and the miserable weather that prevailed during the sugar-making season last year and the year previous, induced many men not only to abstain from planting more cane, but to determine to plough up what they had. A favourable winter, and a genial spring, have happily operated to stop this process. The cane is taken into favour again. Planting is going on anew. The abandoned mills are again at work, and confidence is restored. The planters and manufacturers are beginning to understand what they are doing, and what they have to expect, and they find the reward promised fully equal to the toil and expenditure required. The experience of the last year or two has thrown a great deal of light upon the worth of the several sorts of cane; some being of little value, and some of special adaptation to particular circumstances. The planters are acquiring knowledge of the soils best suited to the several varieties of cane, and the treatment needed to bring out their virtues. They are also finding out when it is best to plant and when to cut. At first mistakes were made in these matters that will henceforth be avoided. It is hoped too that the want of harmony between the sugar makers and the growers, which was the result of misunderstanding and misinformation on the part of the latter, may be no longer observable. They now see the bulk that can be grown, and what it costs to grow it, and are able to compare the results of growing cane with the results of growing maize. It is generally admitted that an ordinary crop of cane pays far better than an extraordinary crop of maize. On this point we quote from the letter of our special reporter to the Clarence. He inserts the evidence given by the lessee of one of the sugar mills:—"In reply to queries about cane and corn, I would say that I am this season paying from £15 to £16-10s. for good full crops of cane per acre, such acres yielding from 35 to 45 tons. I am paying 15s. per ton for cane delivered at the mill. Cane delivered on the river bank at a distance from the mill is worth about 12s. per ton. The cost of cultivating an acre of cane, including thrashing, &c., is £6 to £8 the first year, and £5 for ratoon crops. The cost of cultivating an acre of maize is about half the above. The average yield of cane per acre is about 35 tons. The average yield of dry sugar per acre about 2 tons. The price of sugar at the mill about £32 per ton."

It was considered that New South Wales had no chance as a sugar producer against Queensland. But it does not seem to be so. The yields this season are reported to excel those of the Queensland growers. The cane crop of last season on the Clarence did not cover more than 446 acres—the amount of sugar sold and consumed is set down at 1,072 tons—so that the produce per acre about

have been about 2½ tons. In Queensland however they have overtaken their own consumption; we on the other hand, must multiply our present product by thirteen before we can reach a like point.

SILK CULTIVATION.

CEYLON.

A correspondent gives us the following particulars:—"There is no country better suited for the cultivation of silk than this colony, but unless we are given some encouragement by the Government there is but little hope of our success. Until we are blessed with a Governor like that good and great man, Sir H. Ward, to hope for encouragement in any new industry would simply prove one's fitness for a nomination to an asylum for idiots. All over the Central Province the mulberry thrives. Good cuttings in a year and a half become trees from twelve to fifteen feet in height. I have, as an experiment, put in cuttings only three inches in length, and with moderate care got 90 per cent. of plants. M.—— has not been so successful in the neighbourhood of Galle, for although the plantation at first throve well, it did not survive the dry weather. Mons.—— was new to the country, and because he ordered the plants to be watered and paid for its being done, he took it for granted that it was done. Another experimental plantation has been started in Badulla, which I hear is doing very well. But as yet no attempt on a commercial scale has been made at rearing the worm. Our spirited Director of the Botanical Gardens has got some seed, and is willing to give small portions gratis to such persons as are capable of and willing to try the experiments. Up to date nothing goes down with the public but coffee. The monied men, the agents, are most active in discouraging everything else." [This is great exaggeration, or indeed is an incorrect statement.—*Ed. C. O.*] Very naturally too, as our present staple gives them enormous incomes. On tea, cinchona, or silk they could scarcely levy a black mail.—*Silk Journal.*

The Foresters' Gazette.

BOMBAY, 22ND JANUARY 1872.

ON THE RESERVE SUPPLY OF MATURE TIMBER IN EUROPE.

In the number of the *Revue des Deux Mondes*, which appeared on the 15th of September last, there is an article by M. Brolliard worth some notice; it treats well and fully the subject of the scarcity of mature timber likely to occur in Europe generally, but in France more particularly. Many of the facts mentioned and discussed in this essay are of general interest, especially at a time when the subject of forest management is meeting with so much public attention. The following is a short epitome of the most important passages:—

The reviewer commences by drawing attention to the fact that one of the most serious deprivations to which an industrial state of society can be subjected, would be a scarcity in the supply of timber of workable dimensions: that, although it requires one, or even two centuries to produce a full-grown tree, at the present time more timber of large scantling is consumed in Europe than is being produced. He quotes the maxim of Colbert (laid down so long ago as 1669, but still adhered to in the Code Forestiere of France), that in the State forests, in those belonging to the Communes, or to any public body, no oak tree should be felled before it has arrived at maturity, *i.e.*, when no further improvement in the tree can, during the next thirty years, be looked for. To a strict unvarying adhesion to this rule, during the next century, must France look to ensure to herself the supply of timber which she will assuredly need. Since the end of last century, the rate of consumption of timber in France has greatly increased; up to that time the production exceeded the consumption. Now the case is reversed; the rise in prices has led to the sale of all available timber belonging to private parties to such an extent that full-grown trees in private forests have almost entirely disappeared. Even to many forests belonging to Communes the same injury is being done, though more slowly; while State forests are continually being reduced in area by repeated alienations of land suited for the growth of large timber. At the commencement of this century, trees, 12 feet in girth, were common; now they are rarely met with in the forest. While this diminution in production increases, so do, day by day, the requirements of the timber trade. How are these requirements eventually to be met? During the last fifty years the rate of consumption has at least doubled, and France now imports more timber than she produces. In England scarcely any large trees remain excepting those which are carefully preserved in her public and private parks. She imports twice the amount of timber that France does, of which her colonies [illegible] scarcely a moiety. Holland and Belgium, possessing hardly any forests of their own, are obliged to import largely from all parts of the world. North Germany, though rich in [illegible] lands, allow the [illegible] to be worked at too early an age. The [illegible] rendered possible by the completion of railways, [illegible] their produce to the market; the vast forests of Austria and Bohemia have fallen into the hands of speculators who will soon make a clean [illegible] of their timber. Within the last five years, too, the noble forests on the upper Save river, and on the Julian Alps, have been sold to companies who have purchased them on speculation at 250 francs per hectare (2½ acres), with the view of realizing the utmost profit they can on the sale of the timber. Spain, Italy, and Greece are almost entirely denuded of anything worthy the name of forests. The woods of Mount Etna (of old historical reputation, from which the mountain derived her name of Nemorosa), covering two and a quarter millions of acres, abounding in oak, chestnut, [illegible] and pine, have been, since the sixteenth century, undergoing a system of steady, gradual destruction, not yet quite completed. Italy, whose surface bristles with mountains, possesses hardly 4,000,000 acres of miserable forests to supply the wants of 25 millions of inhabitants. In Russia, the forests have been long worked, and impoverished by every kind of abuse; and now the railways threaten rapidly to use up the few remaining trees. In the steamers plying on the Volga, wood only is used for fuel. Norway, Sweden, and Finland seem at present to furnish all the countries along the shores of the Atlantic with pine timber; not only is it exported by millions of cubic feet to England and France, but Rio Janeiro itself is built of Norway pine; and even Australia and India claim their share of the supply. In northerly climates the growth of timber is at least five times slower than in France, or any more southerly latitude; while the consumption per head for the number of the inhabitants is at least five times greater; this joined to the present rate of export, must exhaust the forests at no very distant date.

In Europe, the difficulty of obtaining wood by importation from the other continents must soon be increasingly felt. England already imports annually many millions of cubic feet of timber from her American possessions. Chicago, a city of 300,000 inhabitants, which has already become, on Lake Michigan, a port equal in importance to Marseilles on the Mediterranean, draws yearly from Canada more timber than France imports from all foreign countries put together, that is, more than half of all the timber annually used in France. This timber again is exported to the Prairie States, which possess no wood, *viz.* to Illinois and Indiana. The late destruction by fire of Chicago, may be considered a warning against the almost exclusive use of wood in house-building. Nevertheless the re-construction of the ruined city will of course greatly increase the demand for large timber. By the St. Lawrence, yet more is carried to New York and the eastern coasts of the United States. The great forests of South America, extending from the Amazon to Paraguay, hardly export any wood; their extreme unhealthiness rendering the working of them almost impossible. Moreover, in these vast tropical forests, the useful sorts of timber are much more rarely met with than in the woods of colder climates. San Francisco is so denuded of timber that the iron works of that region are actually lying idle for want of proper fuel. Further in the interior, the temporary clearings made by the coffee-planters have half ruined the forests. Some of the finest forest tracts on the earth's surface seem to be disappearing without their produce ever having been seen in the markets of the world. Of all descriptions of timber, the most useful is the oak; equally serviceable in carpentry, upholstery, cask-making, and carriage-building: it is necessary too for house and ship-building, and for railways—in certain branches of trade, as for instance in the making of wine casks, no other wood can supply its place,—for all these purposes the French oak is unequalled. African and American oak can in no way be compared to it; the former being far more difficult to work, besides being more liable to warp and split, while the latter is far less durable. But the supply of French oak seems threatened with exhaustion; when France was conquered by the Romans, her forests from the Rhine to the Pyrenees covered a surface of 100 millions of acres; now she hardly possesses 20 million acres of forest-lands. Besides the enormous amount of timber required for ship-building, there is the still greater demand of the wine trade. France manufactures yearly from 80 to 90 million hectolitres (one hectolitre represents 22 gallons) of wine and brandy for home consumption and foreign export. It is a fact worth noticing that the wine trade in France makes five or six times greater demand on the timber-market than does the navy. For all this wine oak-casks are absolutely essential. During the twelve years previous to 1867, about 30 million pieces of cask staves were annually imported into France. In 1869, the importation of these pieces for cask staves had reached to 63 millions, and it seems probable that as [illegible] a wide development of trade, so will this branch of [illegible] rapidly increase. During the last 30 years the price of [illegible] has just doubled itself; and while the call for it increases, and the sources of supply decrease, it is evident that the price must rise almost without limit.

Now, as to the best methods of meeting a crisis that seems inevitable, the reviewer proposes,—*first*, that with the view of economizing her own supply of oak, France should import all the foreign timber she can procure, using her own as little as possible; *secondly*, that the system of mixed coppice (a system well-known to all who have had the treatment of forests to attend to) should be encouraged in all private, and absolutely practised in all State forests. By this system, eight or ten standard trees would be allowed to remain per acre, and an amount of mature timber would be ensured to meet the future demands of the country.

It would be well if attention were more generally drawn to these undoubted facts, touching the prospects of our timber supply; the general diminution of serviceable wood being a question which must affect all countries; and none will suffer more than England and her dependencies should not the matter be taken up in time. The truth of the impending difficulty is perhaps not sufficiently believed in; the greatly increased demand made by the requirements of modern civilization on the timber-market are forgotten. These demands are indeed met for the present, but there is a future to be provided for. Writing as we do for Indian readers, we would wish to impress on all to whom the management of the already mutilated forests of this country is entrusted, that the main object of their work is *not* to see how many trees can be brought to market and sold for the enhancement of forest revenue, but to so sparingly work and husband the resources of the forests that, while providing as far as is safe for present wants, the demands of the future are never forgotten; on the contrary, that they must be kept constantly in view, and that all forest work should be carried on with primary reference to them. It is only by such a system of management that our Forest Department can accomplish its real objects, otherwise it will do more harm than good to the country.—*Indian Public Opinion.*

Official Gazette.

BOMBAY, 22ND JANUARY 1872.

MODEL FARMS—MADRAS.

EXTRACT FROM THE PROCEEDINGS OF THE GOVERNMENT OF FORT ST. GEORGE, IN THE REVENUE DEPARTMENT,—DATED THE 22ND SEPTEMBER 1871.

From the Acting Sub-Secretary to the Board of Revenue, to the Acting Secretary to Government, Revenue Department,—No. 5013, dated Madras, the 23rd July 1870.

I AM directed by the Board of Revenue, to submit the report called for, together with a file of replies from Collectors on the same subject, the last of which was only received on the 27th of May last.

With the despatch to which the above Government order had reference, the Secretary of State transmitted the observations of Major-General Cotton on the experiments made with English agricultural implements that had been reported on, and observed, "considering the slow growth of public opinion in this country in regard to the use of machinery for agricultural purposes, I regard with satisfaction the experiment which has been made in Madras, where the difficulties from the prejudices, habits, and poverty of the people are so much greater than in England." General Cotton observes *in limine* "the first thing that strikes me in this respect is the hopelessness of attempting to do anything vigorously for the improvement of Indian agriculture, unless it is made the special duty of some one to look into the results of such trials as these; to see that the implements are skilfully used; to suggest modifications of them to suit the peculiar crops of the country, so unlike in many cases the crops they are prepared for in England; and to give immediate advice and help to those who venture to take them into use." He points out, in the most forcible language, how impossible it is for Collectors in this Presidency to devote much time and attention to the question, even if they have the necessary knowledge of the subject; and remarks with reference to the report of the Agent for Remounts at Ootacoor, that when improved agricultural implements are in the hands of those who are "actually engaged in farming, and who can look into their use, watch their working, and apply them judiciously to the work required, their success is complete." General Cotton considers that the obstacle which the smallness of holdings and the poverty of the great bulk of the cultivators of Madras oppose to the more general use of machinery, may be overcome by travelling machinery, which would execute the various farming operations for hire. But he urges that "the introduction of the very simplest tools of better form than those now in use" is nevertheless likely to be productive of great economy of labour and improvement in culture. General Cotton observes: "I have great confidence in the skill that can be acquired by natives of India. * * They will use the tools given them with much more delicacy of hand * * than could be hoped for from the English ploughman, and we may take advantage of that in using lighter and cheaper tools, always provided that their first introduction is made under careful warning and instructions." In his remarks on special implements, General Cotton maintains the superiority of the cultivator over any modification of the native plough for the purpose of Indian agriculture, and considers that the difficulty of finding "cattle strong enough to plough the soil to a sufficient depth in India is to be met at present by going over the ground more than once, by ploughing a moderate depth with one plough and following it by another. This, he observes, is one of the improvements specially needed in India, as it is of infinite importance that where the sun is so scorching as it is in the tropics, the roots of all plants should have as deep a bed as possible."

A winnowing machine, he thinks, might be set up in a village at small cost and could hardly fail to answer, and chaff-cutters should be established at cattle-halting places, while travelling thrashing machines might gradually be introduced through the agency of wealthy proprietors. He considers the introduction of the rice-hulling machine "of great importance and worth any effort that can be made." On the general subject of improvement of Indian agriculture, General Cotton makes the following impressive remarks: "In the present state of affairs, the *Government* must act if anything is to be done, there being no Agricultural Society to press improvements and too large a field for any but Government influence to reach at all;" and again, remarking on the slow and partial appreciation of any new efforts to economise agricultural labour, and turn the soil to the best account in other countries, he observes, "if so in England * * what hope is there of India, unless the Government goes into the subject in all parts of the country, and makes the importance of it fully understood;" (lastly,) "the only question seems to be whether so much advantage can be derived from better treatment of the land and the economy of labour now wasted, as to justify the attempt on a larger scale; and no one who has looked into the result of what is called high farming in this country (England), can question this. We are every year more and more astonished with the yield of the land which really seems to have no limit." On receipt of the order of Government, the Board called upon all Collectors to report, after due consideration, what measures they could suggest to attain the end in view; and in their replies above recorded they have submitted their own views and those of the various intelligent persons, European and Native, with whom they have been in communication. The Principal Assistant Collector in charge of Vizagapatam thinks that neither the simple introduction *nor* exhibition of improved appliances is likely to lead to success. The Rajah of Vizianagram, he says, once experimented with the plough sent by Government, but nothing has been heard of the implement for three years. Mr. Sewell strongly advocates the plan recommended by a predecessor in 1863, in the following terms:—

> "There is no doubt the art of agriculture in India is entirely empirical in this as in other things, the natives of the country follow the traditions of their fathers in full faith and simplicity; but they are never slow to adopt changes which recommend themselves to their interest in social and economical matters. Witness the improvement in the cultivation of cotton, of indigo, coffee, and many other products. *I can conceive nothing more suited to foster and develop an improved system of agriculture than the institution of model farms in selected localities. But I apprehend that such undertakings should be superintended by practical farmers from England, men thoroughly acquainted with the whole system of crops, manures, and soil, and initiated moreover into chemistry and the cognate sciences. If left in the hands of amateurs, whether Collectors or Centurions, I look for nothing but failure and self-deception.*
>
> "To these farms should be attached, as apprentices, some of the best lads of the European and East Indian Orphanages. There are several agricultural schools in England, where the training is both practical and scientific, and they are resorted to with the best result as well by those who intend to start in farming with their own capital, as by those who design to get their living as bailiffs, land-agents, surveyors, and the like. *I am confident that the demand for such qualified youths would far exceed the supply, both with planters and native landholders; and so by degrees the country farming would be raised into a science.*"

The Collector of Godavery observes: "It is not to be expected that any natives will purchase the machines and use them at their own expense, without a careful inspection and seeing them at work. Without knowledge how to work them, they will not introduce them;" and he suggests that if implements are sent for exhibition in the district, they "should have persons competent to work them and explain their advantages."

The Collector of Kistna reports that the impression amongst the agricultural population is that European agricultural implements are beyond their means and unsuited to their system of agriculture, either in irrigated or unirrigated land, and to their draught cattle. He adds, that there is no doubt whatever that an unfavourable impression has been created by sending implements up-country to be exhibited by unskilled workmen. The exhibitions have been failures, the implements have been broken, and their repairs on the spot have proved to be impossible. "This mode of exhibiting improvements in agricultural appliances is," he observes, "perfectly

useless." The rice-hulling machine set up at Nedumole has been a failure, the lease has not been renewed. The Sub-Collector of the same district observes that even ryots who "are well-to-do have not the spirit of enterprize to purchase expensive machines, the uses and advantages of which are unknown to them, and the profits from which, are problematical" in their eyes. The Collector of Nellore states that all whom he had consulted, including the Dewan of the Rajah of Venkatagherry, agree that the first step in the matter of improved agricultural appliances must be taken by Government, "but express themselves willing to follow the example set by Government." An experienced agriculturist in the public service in that district proposes that to familiarize natives with these implements, "Model Farms under European superintendence should be established in each district." The Sub-Collector of Cuddapah deems the establishment of a farm under a practical agriculturist the only mode of introducing improved agricultural appliances to the notice of the people; but the Collector doubts whether even then "the present generation would take example therefrom." The Sub-Collector observes that the want of roads must long prove an obstacle to the introduction of travelling machines. The Collector of Madras shows that "the result of holding agricultural exhibitions in creating a demand for improved agricultural implements has not hitherto been encouraging." He doubts, as several others do, whether while labour is cheap and plentiful, the use of costly and large agricultural machines is likely to be general; but thinks that persistent endeavours should still be made to introduce better tools than those now in use, especially at the Government Farm at Sydapet.

The Collector of North Arcot reports that the universal desire is to see the implements, &c., that the ryots may judge for themselves. Ploughs were distributed in 1866; but "owing to the price or some inadaptability to the requirements of the district, they have not found acceptance." The Head Assistant remarks that when labour is so cheap and the number of poor employed in agriculture so large, "the introduction of machinery, *qua* releasing superfluous hands, will not be felt but rather denied." That "the richest puttah-holders never look at their fields, while the cleverest cultivators are the poorest labourers, and therefore are the most opposed to any innovation which might reduce their profits and save the money of their employers." The Collector of Tanjore observes that most of the implements named by General Cotton, can, with great advantage, be introduced, in parts at least of Tanjore. "But," he adds, "the main difficulty lies in securing the requisite mechanical skill in handling and using these implements, by which alone fair results can be attained and the agricultural classes convinced of their actual utility and value in ensuring a saving of labour." The Head Assistant observes that it is "indispensable that we should in the first introduction of ploughs, &c., take care that they are only entrusted to the handling of skilled labourers." Positive harm is caused "by bungling and failure at the outset." A large body of mirassidars in the district have expressed themselves ready to subscribe to get implements down, if the skilled labourers and trained cattle can be found to accompany them. The Officiating Collector of Madura indents for three sets of implements "with persons qualified to use and keep them in order." He states that the ryots are unwilling to purchase any at present, but considers "that if an opportunity were afforded them of seeing some of the simpler implements properly worked, they are sufficiently intelligent and enterprizing to appreciate them, provided the work done in their presence shows conclusively that the implements exhibited are well calculated to economize labour and develop the resources of the land." Messrs. Yorke and Scott, two practical agriculturists, offer some excellent remarks on the kinds of ploughs and other implements required for this country.

From Tinnevelly the reports are very full. The Collector says that the universal desire is to see by experiment that the agricultural implements offered, are more effective than those in use. The zemindars, he says, will adopt no change "unless it be forcibly demonstrated that the purchase would pay." He therefore strongly advocates "the establishment of a Model Farm, fully convinced that nothing will really ever be done by making desultory experiments here and there over the country, such experiments being conducted often by men who really understand very little about what they profess to teach." He recommends that a farm be opened in connection with the Jail under the superintendence of Dr. Thompson, the Superintendent. The Acting Sub-Collector likewise deprecates "random trials here and there" of improved implements, and urges the establishment of a Model Farm in each district, remarking that the Government would probably be glad to instruct the ryots about many matters "connected with farming, such as rotation of crops, growing special crops for the sole use of cattle, the use and value of wells and manure in high farming small areas of dry land; all points which the natives require to learn a good deal from us about. But to do so, or to secure the adoption of improved implements of husbandry or methods of agriculture, successful results "must be systematically and persistently worked out before the people." In a very useful letter, Dr. Thompson, the Superintendent of the Jail, deprecates the promiscuous transmission of new agricultural implements into the district, but urges measures being adopted to introduce improved method of cultivation and to instruct natives in all branches of improved agriculture. He instances many serious and wasteful defects in the existing native methods of husbandry in respect to the cultivation, both of rice and dry land, which would be remedied by instruction and by observation of the principles and practice of improved husbandry. He urges "the systematic formation of farms at each district head-quarter station," in which the rearing of live-stock should be combined with tillage, and he considers that, with time and care, such farms should turn out self-supporting and remunerative. He would attach one to each Jail, and considers that Municipalities also should establish Model Farms. The Commissioner of the Hills, reporting after the close of his Agricultural Exhibition, states: "I see little prospect of the introduction of modern machinery and improved methods of agriculture until a farm has been established by Government, wherein natives could watch the working of better implements, and could see the result of improved modes of culture in the standing crops." He observes that "there is scarcely a province in Prussia which has not its State Model Farm," that "agricultural institutions are in other countries maintained or aided by the State," and that "with a view to satisfactory progress in the general improvement of agriculture in the Presidency, the State must be prepared to step in, and take the initiative by the establishment of Practical Farms." Mr. Brooks describes the miserable deficiencies in agriculture on the Hills, notwithstanding great capabilities, and he places on record a memorandum by Lord Tweeddale, and one by Mr. Veterinary Surgeon Thacker, on the subject of breeding cattle, and adds, "no attempt to introduce modern agricultural appliances or to improve the breed of cattle will meet with real success, until the Government take the matter in hand and secure the services of a practical agriculturist to show the way as suggested by His Lordship." Lord Tweeddale is of opinion that, "it is of the greatest consequence that everything should be well considered and carried out profitably, before Natives or Europeans are invited to follow the example set by Government." The Collector of South Canara states that the cultivators of that district are thoroughly alive to their own interests and ready to take advantage of useful implements, but that it is necessary that they should be exhibited before them in full work to enable them to judge of the advantage of using them. He thinks that the casual exhibitions hitherto tried are soon forgotten and fail to convince, and suggests that acquaintance with mechanics and the principles of agriculture might be made part of the curriculum of study necessary to obtain employment in the Revenue Department of the public service. Mr. Pfleiderer, to whom the Board are much indebted for his interesting communication, after noticing various defects in agricultural processes, now sufficiently obvious and their remedies, remarks—"but such improvements, if they shall be effective, ought to be demonstrated *ad oculos*, and not merely by pamphlets and publications. A Government farm in each district, under intelligent supervisors and carried on on enlightened principles, might indeed be a great blessing, and would be certain to lead to a gradual, but sure development, of the country and its resources in every respect. Simple importation of foreign agricultural implements is not enough. They must be adopted to the requirements of the soil, climate, cattle, and people; it must be demonstrated by real use how to be used with advantage, how to be treated, and to be kept up."

The Collector of Malabar remarks: "The more wealthy agriculturists would go to the expense of providing themselves with improved implements were they satisfied of the advantages to be derived." And Mr. Login considers that they are quite as ready to do so as the people of England. He notices the waste of manure, the indifferent ploughing, &c., and considers that the value of improved agriculture must be demonstrated to the people by actual experiment. In his opinion, what is required is some institution where the people may be taught by actual experiment the many methods and the use of the many machines and implements employed in agriculture. "It is foolish," he adds, "to suppose that the methods and implements in use elsewhere will be equally well-adapted to this country; but the people, if properly used, could contribute very largely to the practical working out of the questions that would arise simply by criticising where methods and implements in use elsewhere are practically experimented with in India. What is required is a school to which at least at first all classes should have free access." Thus from every quarter, and with the authority of all best qualified to judge, there is an almost unanimous opinion and desire that attention should now be seriously given to raising the status of agriculture in this country, to promoting its efficiency, and to giving a vigorous impetus to the improvement and study of practical farming. The Board believe that this cannot be done without the interposition of Government. The advantages to be derived from a scientific knowledge of agriculture in a country where three-fourths of the people live directly thereby and the public revenues are mainly dependent thereon, cannot be denied or exaggerated, however, existing shortcomings may be excused and excellencies in the traditional methods of culture admitted. In this matter, as in any other great system of popular education, it is necessary at least at first that the Government

should intervene, and by their example enlist the sympathy of the zamindars and the well-to-do landholders, through whom improved systems may gradually be transmitted to the lower classes of the proprietary and tenantry. There are no doubt many who only need encouragement to take up agriculture as a science, and to learn, *by seeing*, what they ought to do. The vast and steadily increasing revenue which is derived from the cultivation of the country, and the stimulus imparted by largely enhanced prices to the demand for land, and the investment of capital in the spread of agriculture, seem to indicate that the time has fully come when the Government should take decided action for the promotion of agriculture, and adopt a system for the gradual advancement of agricultural education, intelligence, and knowledge, for the improvement of indigenous stock, and for the development of the resources of our fertile, but neglected, over-worked soils. The obligation has been fully acknowledged by the Secretary of State and other Administrations in India, and is countenanced by the example of all civilized States. The Board resolve therefore to take this opportunity of earnestly urging the necessity of establishing efficient Model Farms with classes for practical instruction. The first might be at once established in connection with the now flourishing farm at Sydapet; and, as soon as Superintendents have been trained to take charge of them, similar Model Farms on a smaller scale might be established in each district for the study and encouragement of local agriculture, adapted to its peculiarities in respect to soil, climate, and natural condition. Classes for elementary instruction in agricultural science might also be formed in connection with zillah schools. The advantages to be gained by such persistent and systematic efforts need not be discussed in the face of the examples set by England, Ireland, Prussia, and the Colonies. Possibly local Agricultural Societies in great measure, independent of State-aid, might spring up in such districts as Vizagapatam (under the patronage of the Vizianagram zamindar), Tanjore, Malabar, &c. As above noticed, there is in the Government Farm at Sydapet the means of making a beginning. The Superintendent who has recently joined it is a thoroughly trained and scientific agriculturist, and his experience has satisfied him and the Farm Committee that Model Farms can be established with a reasonable hope of their being made self-supporting. What is now required is that the Superintendent's ability—he holds a diploma of the Royal Agricultural College—may be still further utilized by the establishment of an agricultural school in connection with the farm, where overseers and labourers may be trained, and whence they may be sent up-country as the means of extending operations to other districts become available. Should the Government see fit to express their general approval of this proposal, the Board are prepared to make an estimate of the probable cost, and to lay down detailed rules for the management of such farms and classes. They entirely concur in the almost unanimous expression of opinion against the continuance of such desultory experiments as have hitherto been made with a view to improve the agriculture of the country, and are satisfied that more harm than good is done by them. As regards implements and machines, the Board believe, that what are wanted at the present time are such modifications of the simplest implements, (*a. g.*, ploughs, drills, cultivators, &c.,) as render tillage more efficient by increasing the productive powers of the soil *at a moderate cost*, rather than such as economize labour. Labour and animal power are still abundant and cheap, and must, for a long time, successfully compete with steam as applied to tillage in this country. Mr. Robertson's experience will no doubt soon enable him to prepare a list of all such implements as are likely to be practically useful on an Indian Farm, and to suggest modifications to adapt them to the peculiarities of this country. For example, on the Government Farm at Sydapet it is found that even with high lifts water can be raised (and that too with far greater economy, certainty, and regularity) by bullock power and picottah than by the steam lift, comparatively large as the stream raised by it is. Indeed, the great cost of fuel, and the expense of tedious repairs, &c., preclude the use of the latter altogether. In native hands up-country the use of any such machine is simply out of the question. Erected on a Government Model Farm the chances are that a steam water-lift would swamp all profits from wet agriculture, and probably repel rather than attract the attention of native agriculturists to improved appliances. There are no doubt special localities where such a machine might be useful and economical, but the conditions of any such locality must be a subject of special consideration, and a careful estimate should be made before attempting any such expensive application. For some time to come, however, it would be better to discard steam-pumps altogether. The steam-plough again, is, so far as the Board can judge, unsuited to the present conditions of the country. Though applied to agriculture it is not really an implement used by the agricultural population in the less wealthy countries of Europe. Capitalists or large proprietors in England, invest capital in what is more or less a commercial speculation, and contract to do the ploughing at so much an acre. In this Presidency, the Government alone is for the present in such a position as a large landed proprietor as would admit of its owning and working a steam-plough, and the Board are not disposed to advocate any experiment in this direction at present. Even in England it is not an easy thing to start and maintain a steam-plough in remunerative working, except in wealthy districts with large farms; and the cost of cultivation even then (with cheap coal and skilled labour in abundance) exceeds what it is possible for the dry land in this country to pay. The Board observe, from a recent Journal of the *Royal Agricultural Society*, that the Duke of Northumberland's tenantry pay 10 shillings an acre for the ploughing of their land. In some places as much as 14 to 16 shillings is paid. This operation is done on the Government Farm at Sydapet, with powerful cattle and Ransome's improved ploughs at 1s. 6d. to 2s. an acre; and the ordinary charge in this country is from 8d. to 2s. (6 annas to one Rupee). It would probably not cost Government less than 15s. to 20s. an acre to plough in this country with an improved steam-plough; and there is no part of the country where the ryots could be induced to pay for it. It must be further borne in mind that there are few districts in which such a machine could be moved in the absence of roads; and it is probably wholly unsuited to wet agriculture which alone could afford to pay such largely enhanced rates. Hulling-machines too should be discarded from the category of agricultural implements. Hulling rice is a manufacturing process. It takes the place that milling does in England, or garbling coffee and preparing it for export does in this country. The producers do not hull their paddy for the market. It is purchased as paddy by the dealers, and can best be carried in this form, and it is hulled for the market or at the port of shipment by a special class of labourers with great skill and at reasonable rates. At Madras, 18 measures of paddy are issued to the hullers, who return 6 measures of well cleaned and unbroken rice, and sometimes one-half of the husk also. Up-country the rate is cheaper. There is no doubt that a suitable rice-hulling machine is a great desideratum in Madras; but it is for capitalists and manufacturers to turn their attention to this matter rather than farmers and agriculturists. Probably the firms who (according to General Cotton) are using machinery in Burmah, are large exporting firms. These are the proper persons to interest themselves about hulling-machines. It has been found impossible to use the rice-huller at the farm. It requires steam-power; and a large capital would have to be invested in the purchase of rice to keep it employed. The same may be said of bone-crushing. It is scarcely a farm operation. It is much to be desired that there were bone-crushing factories all over a country like India where lime is so deficient in the soil, but this unwholesome manufacture must not be thrown on the agricultural institutions of the country. It is a significant fact that although the export of bones from Madras to Ceylon is very large, no crushing-machine has yet been set up in Madras to reduce their bulk and so facilitate stowage.

The Board decidedly approve of agriculture as an occupation for convicts, but do not consider that Jail Farms could ever take the place or properly answer the purpose of the Model Farms, the establishment of which they are now advocating as a means for raising the status of agriculture and enlisting the interest of the well-to-do classes. Jail Farms cannot be public institutions, open to the inspection and participation of the people, and the association might tend to degrade rather than elevate the subject in the eyes of the people. At the same time they are of opinion that arrangements might well be made with the co-operation of the Farm Committee for instructing Jail Overseers and Deputy Jailors, under Mr. Robertson's superintendence, or trained workmen might be sent by the Committee to instruct prisoners in the use of improved implements at the various Jails; but any efforts that are to be made to affect the agriculture of the country permanently must be systematic and persistant under such complete and established organization as shall command success. There is much to be learnt of the agricultural conditions of this country before European science can be applied to their improvement, and this knowledge cannot be gained without some opportunity of study and experiment at Model Farms and careful observations. The Board learn that already zemindars and others are sending their ploughmen and farm labourers to be instructed at the Government Farm in the use of improved implements of various descriptions. The Maharajah of Vizianagram, the Zemindar of Calastri, the Jaghirdar of Arni, and some of the Mirasidars of Tanjore have set the example, and it can hardly be doubted that with greater facilities of education *within their own districts* very many substantial ryots would gladly avail themselves of the opportunity of studying the various improvements in agriculture introduced by other nations.

Order thereon by the Government of Fort St. George,—No. 1657, dated 22nd September 1871.

The Government have recently reviewed the report of the Sydapet Farm Committee for 1869-70 and 1870-71, and have recorded their satisfaction with the very valuable results which have been attained under the skilful management of Mr. Robertson, the Superintendent. They consider that the time has now come when the Government may, with confidence and advantage, extend their operations over a wider field, and afford to the agricultural interests of this Presidency those benefits and aids which are being extended to them in other parts of India.

Two courses are open to Government for this purpose. They might inaugurate operations on a large scale, and endeavour to exhibit the results of high farming over wide areas, with expensive machinery and establishments in a manner to attract the ryots; but they are confident that no real good would be derived from such a course, and that it would rather tend to discourage enterprise. They prefer the less ambitious method of establishing Model Farms of moderate size in several localities, with the view of demonstrating to the ryot the practicability of effecting sensible improvements by means quite within his reach. The distinct objects at which the Government would aim may be epitomized as follows:—

(1.) To ascertain by experiment the proper use of rotation in crops in this country.
(2.) To introduce the system of root or green crops in lieu of fallow, without artificial irrigation.
(3.) To introduce new crops.
(4.) To provide new kinds of seed, and fresh seed for the crops now cultivated.
(5.) To make experiments in the use of water for the cultivation of crops now termed "dry" crops, and for raising grasses and other crops to be used as fodder
(6.) To make experiments in the use of lime and other manures—mineral and animal.
(7.) To introduce new and improved implements of rural labour.
(8.) To improve the working cattle, sheep, horses, and other varieties of live-stock in the country.

It is evident from the foregoing that the scheme will be mainly one for the improvement of dry cultivation; and although wet cultivation is incidentally affected with reference to seed and implements of labour, still the main objects of inquiry and experiment are dry grains and unirrigated products, cotton, silk, tobacco, indigo, wool, &c. There can be little doubt that the cultivation of rice and of the sugar-cane is well practised, and a due economy of water is the only point which need attention at present in regard to it. Regard being had to the number of objects in view as above indicated, the Government consider that the proposed farms should be:—

(1) of considerable area; (2), in different climates and at different elevations; (3), and placed conveniently with reference to water-supply, minerals, markets, and communications.

The area the Government consider should be not less than 200 acres for each farm, for although it may not at first be expedient to reclaim and cultivate more than 100 acres in each, still the additional cost of securing the larger area will be immaterial, and the command of means for future expansion is eminently desirable. The extent not immediately required for Government purposes might probably be leased out at yearly rents, or might be used for pasture, growth of firewood, &c. The localities which for the present approve themselves to Government for the Experimental or Model Farms are the districts of Bellary, Coimbatore, and Tinnevelly. Should it hereafter be deemed desirable to add a fourth farm, it might be placed in Salem Baramahal, or perhaps by preference in Ganjam, where it would be accessible to the people of Vizagapatam. These districts are comparatively backward and inhabited in part by Oriyas, the least developed of the people of the plains, and in part by hill-tribes, almost destitute of any culture. But the districts have great capabilities, the climate is far more temperate than what prevails in the rest of the Presidency, and is probably specially suitable for the culture of indigo. The primary object of the Bellary farm should be the cultivation of cotton, and the experimental use of varieties of seed, methods of culture, and mechanical processes; but a portion only of the area should be of the "black cotton soil," and the remainder should include other varieties of soil adapted for miscellaneous tillage. It will be an essential condition of selection that some portion of the area shall have means of irrigation, either from a well-supplied tank, or from reliable wells, or at least that water shall be attainable at such reasonable depth as to allow of wells being sunk and worked without extravagant expense. In Coimbatore the special objects should be silk-culture, the growth of tobacco and cotton, the breed of sheep, and perhaps the breed of horses, and, with these in view, attention will be directed in the selection of a site to the suitability of the soil for the cultivation of the mulberry and of tobacco, and to a command of water for raising green-crops for the sustenance of live-stock. The farm should, by preference, be at a high elevation. In Tinnevelly the position will be selected partly, but not chiefly or exclusively, with reference to experimental cotton cultivation. The farm will be for general experimental cultivation, in which cotton will have a part, and in which regard will also be had to tobacco, senna, &c.

In selecting the sites for these farms the Government do not desire that the requirement of first-rate quality of soil, of whatever category should be insisted on. It will be sufficient that the land be of fair average quality, that its situation shall enjoy at least an average rain-fall as compared with the rest of the district, and that there shall be some partial water-supply obtainable from a channel, a tank, or from wells. A site will, of course, be selected conveniently placed as regards roads and existing or projected railways, and, if possible, within easy distance of a fair market for the farm-produce, including meat. The neighbourhood of limestone of a quality fit to be burned for agricultural purposes would be desirable but not indispensable. The experiments made at the Madras Farm in the use of lime are encouraging, except as to cost of preparation. These District Experimental Farms will be placed in connection with the Sydapet farm, and under the superior management of Mr. Robertson, in whom the Government possess an officer admirably fitted for the post, and who adds to his other acquirements, as a scientific and practical agriculturist, the great advantage of several years' experience of India, popularity with natives, and a thorough appreciation of the fact that the experiment to be successful, must be economically conducted. Mr. Robertson's present engagement expires on 10th October 1871, and from that date his salary will be raised to Rs. 700 monthly, with horse allowance of Rs. 30 monthly, and his travelling expenses when absent from the Presidency on duty. He will retain his residence on the Sydapet Farm, free of rent. Mr. Robertson will come under the Uncovenanted Service Rules, regarding leave of absence and pension, and his service will date from the commencement of his original engagement. His duties will be to have the superior management of all the Government Farms which may be established now or hereafter, the superintendents in immediate charge being his subordinates; to prescribe the course of operations, and to train the apprentices who may be placed under him for the superior charges. The Government have entire confidence in Mr. Robertson's competency for this important duty.

The general supervision of the agricultural experiment will be placed under the Board of Revenue, through whom Mr. Robertson will, in ordinary course, submit his reports and address Government. But his reports on the individual district farms he will forward to the Board, through the Collectors of the districts to which they refer, so as to keep those officers informed of the progress of the local experiment, and to allow them the opportunity of recording any remarks they may wish to make. Mr. Robertson will understand that the Government expect him to consult fully with the Collectors as to all action in their respective districts.

The direct management of each farm will be conducted under Mr. Robertson's orders by a Native Superintendent on a salary of Rs. 150 monthly, rising to a maximum of Rs. 250 by annual increments of Rs. 25. To provide the necessary agency the Government resolve to establish four native Apprenticeships at once, and to attach to them salaries of Rs. 40 monthly, with lodging on the Sydapet Farm, and to instruct the Collectors of Bellary, Coimbatore, and Tinnevelly, to select for them from the ryot-class of their respective districts, or from some class connected with the land, each one young man, of age between 18 and 20 years, of good constitution and possessing a colloquial knowledge of English, who may be willing to enter into the engagement. The posts of Farm Superintendent will be given to the best qualified Apprentices at the end of three years' training. The Collectors will also proceed to select in their respective districts one or more blocks of land, either waste or cultivated, extending approximately to 200 acres, and fulfilling the conditions above specified to serve as an Experimental Farm. The land being indicated, Mr. Robertson will be deputed to visit the site and report upon it. He will submit to Government through the Board of Revenue—

(1.) A rough estimate of the cost of establishing an Experimental Farm of the dimensions prescribed, contemplating, in the first instance, the cultivation of 100 acres.
(2.) A general estimate of an approximate character of the probable permanent charge which will be incurred for establishments, including his own salary at the Government Farm at Sydapet, and at the three Provincial Farms, making provision for four students at the Sydapet Farm.
(3.) Proposals for the reclamation and management of the three projected Farms until they can be placed in charge of their permanent Native Superintendents. It may be presumed that the requisite buildings could not be raised, and the necessary improvements perfected in less than two years from the present time.

As to the source whence the funds for this agricultural experiment shall be derived, the Government are of opinion that the Surplus Cattle Trespass or Pound Fund furnishes a suitable and sufficient provision. Act I. of 1871 provides that this "surplus shall be applied, under the orders of the Local Government, to the construction and repair of roads and bridges, and to other purposes of public utility," and the Government consider that the object in question is a most appropriate purpose on which to employ part of the funds. The budget for the current year estimates that an unapplied balance of Pound Funds of Rs. 77,000 will remain at its close, after allowing for a liberal allotment for roads and bridges, and the demands on the balance for the Experimental Farms cannot possibly be large for the remainder of this year. The contribution from this source for roads, &c., in aid of Local Funds will not hereafter need to be on so liberal a scale as hitherto, and the Government do not doubt that ample means will be available for developing the present scheme. They commit it to Mr. Robertson, and to the Board of Revenue, and District Officers, with the confident anticipation that no efforts will be spared to ensure success, and in

full hope of valuable results being attained for the improvement of the country.

MR. LOGIN'S EXPERIMENTS.

Extract from Mian Fazal, C.E., E. E. Off., Secy. to Govt., Punjab, Public Works Department, to the Offg. Secretary to Government, Punjab, No. 3280, dated Lahore, 24th November 1871.

By order of His Honor the Lieutenant-Governor, the undersigned has the honor to forward, for disposal in Civil Department, Superintending Engineer's (2nd Circle) No. 7434., of the 8th ultimo, forwarding Mr. Login's report on cotton cultivation.

Extract F. Login, Esq., C.E., F.R.S.E., M. Inst. C.E., P.W. Department, Punjab, to the Superintending Engineer, (2nd Circle), Umballa, dated 20th October 1871.

During my late inspection tour at the end of September, I visited my several experimental cotton fields along the Grand Trunk Road between this and Delhi, and, in continuation of my reports on the experiments of last year, I beg to submit a report of the success which has attended my experiments this season up to the present.

No. 1 experimental cotton field, 20 miles from Delhi; agreement with Zemindars.—The first is in the compound of the rest house at Rai, on the 20th mile of the road from Delhi. The agreement with the zemindar who cultivated it was that he got the land rent free and the produce, he supplying all the labour; so that in fact this experiment cost nothing but supervision, which the Sub-Overseer could do without any loss to Government.

Area of this field.—The area of this field is 32,890 square feet, or 236 square feet over three-fourths of an acre; but as there are two trees which overshadow the field, and have thus stunted the neighbouring plants, the correct area is about exactly three-fourths of an acre.

Details of cultivation of ditto.—The soil, which is rather good and has been under grass for several years, was *not* manured, but irrigated. The ploughing began on the 28th May, and was ploughed six times, and the ridges, 3 feet apart, were thrown up as before described, when the first watering was given; and on the 10th of June the sowing of the seed was put in at two feet apart in the usual manner, and three seers fourteen chittacks were expended, or 10½ lbs per acre. This operation was completed on the 12th by one cooly; so the extra outlay on this only amounts to about 8 annas per acre, while the seed would not cost 4 annas more; thus the saving on seed alone would pay for sowing. The field has been watered since the sowing five times, or in all six waterings, and the weeding has been done four times in all.

Present state of ditto.—There are at present 5,436 plants, which average four to five feet high, and no plant was permitted to exceed five feet, so as to make them to give out a number of branches. The effect has been that, after counting a number of plants, it was found that each plant gave off about seven branches, and each branch about 15 twigs, while on each of these there are some three or four pods; so it can be easily imagined that the whole field is now thickly covered.

Probable yield.—The natives say that the yield will be about 15 maunds of "kapas," which is now selling at nine seers per rupee; so this at once represents a sum equal to Rs. 65-10-8, or nearly £9 sterling per acre, while the expenditure can in no way exceed £2, leaving a profit of 350 per cent.

Ultimate results.—Surprising as these figures may appear, yet they are not more so than seeing the field itself, and prove to my mind, if I ever had any doubts, that India can and will compete with the world in the produce of this great staple of industry.

Opinions of the natives regarding this system of cultivation.—Fortunately on this occasion I left the zemindar to supply the seed himself, so the next field, to mine, which this man also has under cotton, can at once be compared with mine; and it is all the more so that, for reasons I cannot attempt to explain, my cotton plants, some six weeks ago, threw out a number of *red* blossoms while in next field they were yellow or white; so the people all said I have brought the seed from foreign countries, till the zemindar convinced them that he himself supplied the seed. Now, however, the blossoms are yellow and white, and very few red ones remain; so all doubt as the question of seed has vanished.

They fear ridicule less now.—Considering my objects in making the experiments, I regret to say that the old story still prevails, though I think not so universally as it did last season, namely, that I am making these experiments with the view of enhancing the land revenue, which is, in the Delhi and Karnal districts, now being settled, so the people see that I am in no way connected with the settlement; so I trust next year a number of zemindars will be induced to try the Egyptian system themselves,—and in some instances this has been done.

Experiment undertaken by a zemindar.—Near Karnowli, at the third mile from Delhi, Lala Narain Das, my Assistant, got a zemindar to try a small patch, about one-fourth of a beegah, on the Egyptian system,—this man having seen the wheat experiment at Karnowli last cold season. He however did not do the sowing properly, and it was rather late in the season also. The Sub-Overseer, however, by judicious thinning, was able to make something of it, though the zemindar thought all was ruined by so doing, and the yield will probably exceed 100 lbs per acre; but, being outside property, I cannot have the power of testing the yield of this field. It was however most gratifying to me to see the pleased countenance of this zemindar when I visited this field, and to hear him say that, though by my plan there were not one-fourth the number of plants, yet it was *dugna fidah* (twice as profitable) than the old system. He said he would try a lot of cotton next year, and that he would have one of his fields sown with wheat this rubbee, now at hand.

Favourable impressions on the native cultivators.—From the above, therefore, it will be seen that a good impression is being made on the minds of the native cultivators, which, if encouraged, cannot but lead to satisfactory results,—and this in a much shorter space of time than many are prepared for,—as few people are more alive to their own interests than the natives of India, once it is clearly shown them that this or that is profitable.

Favourable impressions on the native cultivators.—In fact, my Sub-Overseer, Zoolfikar, says that a great number of zemindars have visited the fields near Ambala, and hundreds of them say they will try this system next season; so all that appears wanting is encouragement in some shape or other,—such as remissions of land rent for the first season where they give the system a trial.

No. 2 experimental field, 18 miles from Ambala; giving details.—To return to the cotton fields near Ambala at the 102nd mile, or 18 miles out of the station. A zemindar, called Suhoo, was persuaded to give his field for trial, he getting all the produce, and I guaranteeing him against any loss. The field measures 130 by 95 = 12,350 square feet, or two-sevenths of an acre nearly. The field was watered on the 22nd May 1871, ploughed four times, and, after making the furrows, the seed was put in the same as in other cases two feet apart on the ridges, on the 27th May. Nine days after, the plants had all sprung up, when manure was spread over the field, and on the 9th June this field got a watering; so as the rains began the following day, there was no more watering till September, when it got water twice; but during the interval it had been weeded four times, and twice more in September, or in all six times; and on the 24th June a little more manure was spread over this field.

No. 2 experimental field, 18 miles from Ambala; giving details.—Up to the end of July this was the most promising field of all,—the plants looked like goosberry bushes, but on the 2nd August the flood caused by the overflow of the Markunda river found its way to this field, six miles away from the river, and stood at a height of three feet above the ground for three days. This injured all the plants very much, killing nearly one-fourth of them; but there still remains 1,500 from two and a half to seven feet high; so in spite of the injury done by the flood, the yield is expected to be at the rate of 300 lbs. of clean cotton per acre, as each plant has on an average about 150 blossoms,—one as many as 275 of them. Picking began on 15th September, and the first month 34 seers of "kapas" had been collected, or about the rate of 80 lbs. of clean cotton per acre.

No. 3 experimental field, with photograph attached.—At mile 108th, or 12 miles from Ambala, is another field, measuring 138 by 97 = 13,386 square feet, or about five-sixteenths of an acre. This field was once manured, three times watered, and four times weeded. Up to the 16th October the yield of "kapas" was half a maund; and the probable yield will, it is said, be over three maunds, or 80 lbs. of clean cotton, which gives a rate of 200 lbs. per acre of clean cotton.

No. 3 experimental field, with photograph attached; native opinion and increased length of fibre.—This field also got flooded, which injured the plants considerably; yet for all that, to compare this field with those sown on the native system near it, is most satisfactory, or, as the owner of the field said to me, it was a capital "turkeeb." What perhaps pleased me here, most of all, was to find that the length of staple of my cotton, grown from the Bahalgurh seed of last year, exceeded the length of that grown on the native plan at least one-third.

No. 4 experimental field, with photograph attached.—The next field is situated at the 111th mile, or nine miles from Ambala, on the land attached to a European rest-house. The ground is good, and has been under grass for the last ten years; and this experimental field measures 195 by 100 = 19,500 square feet, or nearly nine-twentieths of an acre. The peculiarity about this field is that it was neither manured or irrigated,—only weeded six times. There are 3,000 plants, none exceeding eight feet, or less than two feet in height; and one of them has had no less than 370 blossoms—the least being eight, the average being about 100; and the height of the plants averaging about four feet.

No. 4 experimental field, with photograph attached; native opinion.—Up to the 19th instant the yield has been from this field one maund 18 seers of "kapas," and from four to five maunds are expected, or for a whole acre say ten maunds, which would give an

average of clean cotton of 260 lbs. per acre. The zemindars have perhaps been more surprised at the result of this experiment than with any other, as it proves that *care* is the great thing required; and many say that they will next year sow one-fourth the area with cotton, and bestow four times the care on it, and still get the same yield; thus they will have the remaining three-fourths for other crops.

Total area of experimental fields, and probable results.—Not to lose sight of the foregoing, I will now recapitulate—

	Md.	s.	c.	
No. 1 field, equal three-fourths of an acre, expected to yield..	5	0	0	clean cotton.
" 2 A. belongs to a zemindar, and cannot be tested.				
" 2, equal two-sevenths of an acre, expected to yield ..	1	6	0	" "
" 3, " five-sixtenths " " ..	1	0	0	" "
" 4, " nine-twentieths " " ..	1	20	0	" "
Total ..	8	26	0	" "

Equals total, one and four-fifths acres— ...666 lbs.

or an average, on the whole of 370 lbs. per acre from this season's experiments.

Want of rain in September and October.—Had there been a shower of rain at the end of September or the beginning of this month, the average would have been still greater; but, should the ultimate result be that the Indian cultivators, by the introduction of this Egyptian system, can only produce half this average, what a boon it will be both to India and England!

Further experimental patches near bungalows.—In addition to these experiments, I tried several smaller patches, two of which were completely destroyed by floods, one, the most promising, by stray cattle, and the others, by squirrels and parrots, were much injured owing to the number of trees which afforded them shelter, as well as deprived the cotton plants of the direct rays of the sun; so that the plants, instead of spreading out like goosberry bushes, were tall and lanky—all the more ready to be broken by squirrels and parrots, which last year at Bahalgurh were the cause of annoyance.

Further experimental patches near bungalows.—None of these patches—four in all—will probably yield half as much as those fields that were not in the neighbourhood of bungalows as these were, which in itself is satisfactory, as people might say that experiments tried in bungalow compounds were only garden experiments, while those out in the fields were proper ones,—and this applies not only to the ignorant native, but the educated European.

Willing aid given by the establishment.—In experiments of this nature it would be impossible to succeed without a hearty support of one's establishment; and this I have been fortunate in securing, all taking as much interest in their success as myself; so my share has been more of encouragement than anything else. By persuading several zemindars to carry on the work (I guaranteeing them against loss) enabled me to conduct the experiments at an insignificant outlay, as I only have, up to the present, advanced from private funds the small amount of *ten rupees*, while a little over an acre of Government land, which would otherwise have been in grass, &c., for which the rent would hardly have been Rs. 1, is all that can be directly due to Government on account of the experiments which promise to give such favourable results,—a future report of which will be submitted at the close of the cotton season.

P. S.—Owing to sickness in the office establishment in the first instance, and the promise of a friend to take photographs of the cotton fields, the submission of this report has been delayed.

The photographs are herewith attached, which will show the present state of the field at Shahabad, referred to at paras 18 and 10 of this report, and also of the field spoken of at the 20th para, where there had been no irrigation or manure.

Regarding the field 20 miles out of Delhi, in the last report received, the Sub-Overseer, Chokee Lall, informs me that up to the 24th October the yield of clean cotton was at the rate of 185 lbs. per acre, and during the last six days (from the 18th to the 24th) the yield had been 57 lbs., or a rate per acre of nearly 10 lbs. daily: so, if the frost or some other unforeseen cause does not injure this field, there is every prospect of having 500 lbs. per acre. I may add that the Sub-Overseer's *arzie* states that the plants are now so thickly interlaced that the coolies employed in picking have some difficulty in moving up and down the furrows.

From C. M. Rivaz, Esq., Offg. Under-Secretary to Government Punjab; to the Offg. Secretary to Government, Punjab, Public Works Department, No. 898, dated 11th December 1871.

The undersigned is directed to acknowledge the receipt of Mr. Login's report on cotton cultivation, forwarded with Public Works Department No. 5030, of the 27th ultimo, and to state that His Honor has perused the report with interest, and has directed its publication in the *Gazette*, and copies to be forwarded to the Government of India in the Department of Agriculture, Revenue, and Commerce.

From C. M. Rivaz, Esq., Offg. Under-Secretary to Government Punjab; to the Secretary to Government of India, Department of Agriculture, Revenue, and Commerce, No. 899, dated 11th December 1871.

In continuation of my No. 643, dated the 23rd September last I am desired by His Honor the Lieutenant-Governor to forward six copies of a further report by Mr. Login on the experimental cultivation of cotton.

SEASON REPORTS.

Mr. H. Rivett-Carnac, under date the 30th December 1871, sends to the Secretary of the Bombay Chamber of Commerce the following report on the state of the weather and prospects of the cotton crop in the Central Provinces and the Berars.

Mr. Nago Rao, in his report, dated Comraotee, 23rd instant, writes as follows:—

"I have the honour to report that during the past week ending 23rd instant the weather continued to be cloudy, and a little rain also fell at Comraotee and in its neighbourhood on the 22nd idem at night; but the fall amounted to only 10 cents at Comraotee, and consequently it was not sufficient to do any good to the rabbee crops of the country. Since then the days are somewhat cloudy, but the nights are pretty cool.

"While passing from Comraotee to this place through Mortizapore, I found that in most of the cotton-fields on the road, the picking of *kapas* was entirely over, and that *jowaree* also was reaped and gathered. I met with no rabbee crop, save a few fields between Mortizapore and Karinjah; but between Comraotee and Mortizapore I perceived that in most of the fields wheat was suffering much from want of moisture, and the plants in many places looked somewhat withered. Gram and other rabbee crops looked to be in better condition, but they were not as fresh and healthy as they should have been by this time of the season.

"The reports which I have received from the different parts of the East Berar country indicate that the cultivators are engaged in picking and ginning *kapas*, and that the rabbee crops of the country are suffering from want of rain."

Mr. Beck, the Superintendent of the Farm at Comraotee, writing on the 23rd instant, says:—

"The weather during the past week has been cooler, and a few clouds have been passing most days. A heavy shower appeared to have fallen in the east last evening. The crops during the week have made little improvement. The bolls of cotton now opening are small and few. The Hinganghaut plants will be finished first: they are now nearly leafless; they have not stood the season so well as the Bunnee. The Bordia Jurree plants are healthy and strong, but will give a small out-turn: one fifth of the bolls are opened with little *kapas*, some not yielding any; they are one month later than Bunnee and Hinganghaut, and I think they would do better where there is a greater quantity of rain. The gram on the farm, as compared with other crops, is about equal; wheat, tac, and *alsee* are below the average crops about here. The cultivators' fields of wheat are looking well: they have not gone back this last three weeks as they had done before. The good fields are looking well, and the worst have not improved: they appear to fall off most during the growing season. The linseed has not come up well: the temperature being hot and the soil of a very close nature have been against it. I am making another sowing on loose soil, where I think I shall be more successful."

And Mr. Lloyd, at Lakpooree on the same date, reports as follows:—

"Very little change has taken place since my last visit. Cotton picking is still going on in a few fields, but in most of the fields it has been all gathered. In our fields a small quantity remains to be picked, including the Dharwar. Egyptian, Sea Island, Peruvian, and Nankin will give nothing this season, but in a favourable season I have no doubt they would do well. All the *jowaree* has been cut in our fields, but a little still remains standing in the districts. The rabbee crops are about the same as when I last saw them. The wheat is dying off in places; about one-third of the crops has gone off, and the remainder is very small. The caterpillars which had attacked the grain are not so numerous as they were, but as it is they have done a great deal of damage to the plants. Linseed is looking better and is in flower; tac is pretty good and is coming into bloom.

"The temperature during the past five days has been rather lower. A little rain fell at Comraotee last night, but not enough to do any good to the crops."

Mr. Dunlop, writing on the 25th instant from Boldana, reports as follows:—

"Since the date of my last report, I have had an opportunity of seeing something of the crops above the ghauts in the Boldana district, and learnt what I have been able to learn, they are certainly somewhat better than those in the plains, but still far from what they should be.

"We were threatened with rain three days ago, but happily for the sake of the cotton, the clouds passed away. Picking cotton, and all the question, it is seriously to be regretted that rain has not fallen at Jalnah, for the water-supply of the country is at a very low ebb, and during the hot weather the distress on this account will be very great.

"Cotton comes very slowly into Khamgaon, and I expect to see larger arrivals from the beginning of January, as the cultivators will then realize as much as they can in order to pay the first instalment of the land-rent, which falls due on the 1st proximo. The market at Khamgaon on the 22nd instant, when I was there, amounted to only 1,000 bales, about one-half of which was supposed to be old cotton.

"Mr. Pilton's report is encouraging. The crop on the farm is fairly promising, secured, and I was pleased to hear some days ago that [illegible]

yielded up to date 101 lbs. of clean cotton per acre, which, in so poor a season, is a large out-turn. It was irrigated in the beginning of the season, but it received so little water that I attribute the large out-turn to the ploughing more than to the irrigation."

"*P.S.*—I have just received the following statement of the exports of cotton from Khengaum by railway up to the 16th instant. The figures are:—

Full-pressed Bales.	*Half-pressed Bales.*	*Dolyns.*
2,068	128	51"

And Mr. Pillans, the Superintendent of the Farm at Sheegaum, in his report of the 23rd instant, says:—

"The work has not differed from that of last week—the chief being picking the growing cotton, cutting and threshing and winnowing *jowaree*, weighing and stacking *kurbee*, and irrigating. There are 4,123 lbs. of *kapas* picked up to date, which is chiefly Bunnee and Hingunghaut; Jurree is just commencing. Some of the fields show pretty well.

"The cereal crops are not promising well at all: the wheat and gram does not look well; lac is fair, and about the best of any cereals I have; linseed and safflower are fair. The young forest-trees and bamboos are all doing well. The weather of the past week has been fine, with cloudy days. Our total rainfall up to date is 12·70 inches."

Mr. Noble, in his letter, dated Nagpore, 20th instant, thus reports:—

"Since my last report the weather has been fine, the afternoons being generally cloudy; but I do not think there is much chance of any rain falling shortly, as the nights and mornings have been getting considerably colder. My marches since my last report have been:—

16th, Saongee to Nachangaon.
17th, Nachangaon to Bairool.
18th, Bairool to Dhanori.
19th, Dhanori to Dalwalwara.
20th, Dalwalwara to Arvi.

"The state of the crops remains unchanged; there is still a considerable quantity of cotton unpicked, and the *jowaree* is now being cut on all sides. In the district through which I have just passed, the *khurreef* crops (crops of the autumn harvest) have on the whole been good—in some parts very good—as may be judged from the fact that at several villages, including the villages of Nachangaon and Bairool (the acreages of the land attached to these being of considerable extent), the Malgoozars when questioned have at first answered that the cotton and *jowaree* crops have been very good, being full 'sixteen-anna' ones. In villages where perhaps the land is not quite so good, the crop is generally considered to be a 'twelve-anna' crop, which in reality means a very fair average one. I wish I could say the same of the *rubbee* crop (spring harvest); this I am afraid will be as bad as the *khurreef* in this part has been good. Many cultivators say that it will be as much as they will get if they get the amount of seed sown; while others say that certain fields will give a 'twelve-anna' crop, and others an 'eight-anna' one. From my own personal observation, I should say that unless rain falls very shortly, the poorer fields, the soil of which is unable to retain moisture for any length of time, will certainly not yield very much more than was sown, but the number of such fields in this part is in the minority, and I think that the average yield will be nearly an 'eight-anna' one. Several of the more forward fields are now in ear, and consequently rain would be of no benefit even to the more backward fields, unless it comes within a few days."

Prospects then are about the same. In fact, as far as the quality of the cotton-crop is concerned, no change either for the better or the worse is to be expected. Heavy rain now might stain and thereby affect the colour and quality of the crop, but would in no way affect the out-turn.

THE WEATHER AND THE CROPS.

WESTERN INDIA.

Report of the general character and prospects of the season 1871-72.

Poona Collectorate.—The fall of rain during the season under report was much below the average. The out-turn of the khurreef crops in the western districts has been fair except in the talooka of Joonere, where it is reported to be no better than eight or nine annas in the rupee. The rubbee crops throughout the collectorate were at first very unpromising, but a slight fall of rain in the month of November benefited them. The yield will, it is feared, be but indifferent. The out-turn of rubbee in talooka Indapoor will, it is reported, be about eight annas in the rupee, and in Bheemthurry even less. For want of sufficient rain, failure of water in some places of the Haveilly talooka is anticipated. Fever and ague have been prevalent in a few villages in the talookas of Bhimthurry, Serroor, and Indapoor. A few cases of sporadic cholera have occured here and there. Cattle-disease in a few villages in Mawul. The total fall of rain registered up to the end of the 31st December last was:—In Joonere 21 in. 75 cents; in Hurkulla 61 in. 14 cents; in Patus 12 in. 20 cents; in Baramuttee 11 in. 97 cents; in Poor 60 in. 87 cents; in Seroor 11 in. 25 cents; in Kheir 19 in. 1 cent; in Ghoreh 18 in. 20 cents; in Indapoor 10 inches only; in Shapoor 15 in. 18 cents; in Poona 21 in. 8 cents.

Sattara Collectorate.—The fall of rain was scanty. The khurreef crops however yielded on the whole a tolerably good harvest, the rubbee crops promise pretty well, but if they be not favoured with an early fall of rain, they also will greatly suffer. In these talookas owing to a general want of rain, the sowing of khurreef crops in most parts did not take place at all, and where they were sown, they yielded but a very scanty harvest. The rubbee crops where sown are withering for want of the late rain which failed almost throughout the whole of the district. Fever and cholera prevailed to a certain extent, but very very few persons died of the latter. It has now disappeared. Disease among cattle existed in some of the talookas. The fall of rain was:—In Mahableshwur 188 in. 60 cents; in Sattara 30 in. 21 cents; Jaolee 54 in. 61 cents; in War 18 in. 81 cents; in Koregoan 20 in. 93 cents; in Pahtun 45 in. 85 cents; in Kurrar 17 in. 42 cents; in Malwa 22 in. 41 cents; in Shirala 22 in. 71 cents; in Khundala 8 in. 21 cents; in Tasgoom 17 in. 44 cents; in Khanapoor 12 in. 63 cents; in Mann 13 in. 64 cents; in Khutow 17 in. 68 cents; and in Malseerus 9 in. 9 cents.

Ahmednuggur Collectorate.—For want of sufficient and seasonable rain the khurreef was sown to a very small extent, and with the exception of that in the Parnair and Ankula talookas, where the crop may be considered an average one, the khurreef crop has entirely failed. Rain fell in September, and a large area of land was sown. The fall was not, however, universal as in portions of the district, especially along the course of the Godavery, the rain was not sufficient to enable the cultivators to sow, and considerable tracts of land remain absolutely barren. Rain fell in November, which greatly benefited the crops, but it was partial, and in many parts insufficient to secure a crop. The yield of the rubbee may be estimated at half the average. Many crops have been saved by well irrigation owing to the heavy fall of last year, and to the fall in January of the present year, the wells give a better supply of water than would be expected from the monsoon fall. Many fields have been saved by irrigation from the Lakh canal and the Bhatoodee tank. The grass is insufficient for the live-stock, and in the worst parts of the district, what small supply there was, has long since been exhausted. The state of public health has been generally good. Cholera prevailed to a slight extent in some talookas, and a few deaths occurred. Cattle have died from want of fodder, and are still suffering. A number of cattle have been removed to other places. In some villages of Sumpgaum, Kopergaum, Sewassa, and Sheegaum, many people have left their houses. It is apprehended there will be scarcity of water.

MISCELLANEA.

HOW DAIRYING IS CARRIED ON IN AMERICA.

The butter and cheese factories of New York State number 944, and are supplied daily with milk from 240,000 cows. In the seven States of Ohio, Illinois, Wisconsin, Vermont, Massachusetts, Michigan, and Pennsylvania, there are 208 factories supplied daily with milk from 2,400 cows. It is estimated however that there are in the United States 1,300 butter and cheese factories, supplied with the milk of 300,000 cows, and producing about 100,000,000 lbs. of cheese, and the same number of gallons of milk. Every 300 cows therefore yield every year 100,000 lbs. of cheese, valued, it is stated, at 140,000 dols.; so that each cow yields 333 lbs. of cheese, valued at 47 dols. The export of American cheese to Great Britain in 1853 amounted to 1,000,000 lbs., and this quantity in 1870 had increased to 57,000,000 lbs., valued at 8,000,000 dols.

DIARRHŒA IN CATTLE.

This affection is caused by the change of food, the introduction of acrid herbs and other irritating substances into the bowels, long drives in hot weather, or by rapid change of temperature, lying out on the cold, wet ground, &c. Sometimes it makes its appearance without any obvious cause, while the animal is apparently doing well and fattening. The conditions under which the disease makes its appearance must always be observed. If the animals are weakly, as the generality of them are when attacked by diarrhœa, a tonic in the shape of an ounce of gentian, and a drachm of ginger, twice daily, mixed with a pint of water, or, what is better, a pint of beer, with a change of food, and an occasional walk about the yards for exercise, if the animal is not too weak, will effect a cure. If you have reason to believe that the disease is caused by some irritant in the alimentary canal, give a ½ lb. of epsom salts, or a ½ pint of linseed oil. If it comes on suddenly, with much fever, opium 1 drachm, calomel every three hours, until the symptoms subside. If it has been of long standing, use sulphate of iron, 2 drachms catechu, 1 drachm two or three times a-day, adding now and then a ½ ounce of gentian and a ½ ounce of ginger. If while using calomel the mouth should become sore, desist immediately, as the system is now under its influence, and can be of no further use; continue to use the opium, however, until the symptoms abate; feed liberally, give plenty of water, good bed, &c. Always give cattle medicine out of a bottle in a fluid state; pour it slowly down the throat.

SEASON REPORTS, DECEMBER 1871.

General Remarks.—The rice crops have been harvested generally throughout India, with the exception of Cooch.

All through Central India, Oudh, and the Punjab, anxiety is felt regarding the rabi crops, which have suffered in parts for want of the usual winter showers. The weather in all these provinces is reported to be cloudy and unsettled.

In British Burmah, Madras, and Bengal, the crops are reported to be fair and promising, though, in a portion of the Cuttack country between the Chilka lake and the sea, there has been extensive failure, and some apprehension of distress exists.

The cotton prospects continue to be discouraging in Khandeish, Nassick, and the Deccan, and to some extent in the Southern Mahratta Country. The accounts from other parts of Bombay are, on the whole, favourable.

Cattle disease has appeared in the neighbourhood of Mundla and Jubbulpoor, and in a limited area in the Punjab.

Presidency or Province.	District	Date of District Report.	Rain-fall for fortnight preceding.	Date of Report from Local Government or Administration.	State of Agricultural prospects.	Remarks of Local Government or Administration.
Madras	Ganjam	December 17	Nil.	December 21	Water supply failing in places: migration from tract suffering from drought: market well supplied: health good: prices high but slightly falling.	Government considers the promise of the season to be good except in parts of the Northern Circars. The markets are well supplied by local produce or imports. Prices are rising generally owing to the demand for distant markets, and in the North from partial failure of crops.
	Vizagapatam	20	Nil.	...	Markets well supplied: health good; prices slightly rising.	
	Kistna		Nil.	...	Dry crop good; wet crops not satisfactory in parts: markets fairly supplied: prices steady; large exports to Hydrabad Country.	
	Kurnool		Nil.	...	Dry crops fairly good: wet crops suffering in parts: prices have slightly fallen.	
	Negapatam	"	3·53	...	Prospects favorable: prices rising.	
	Trichinopoly	"	2·26	...	Crops in good order; harvest below the average: prices rising.	
	Calicut	" 19	0·66	...	Prospects good; prices low but rising.	
Bombay and Sind	Hydrabad (Sind)	"	Nil.	December 21	Districts healthy: no cattle disease.	
	Kurrachee	" 20	...	...	Agricultural reports favorable, but cotton has suffered from frost. Indus at low level. Cotton indifferent.	
	Shikarpore	"	..	...	Cotton fair.	
	Ahmedabad	"	...	...	Cotton good.	
	Gooserat	"	*0·02	...	Cotton good: late crops favourable, slightly damaged in Broach by cloudy weather.	* In Ahmedabad.
	Khandeish	"	Nil.	...	Weather cooler: grain crops middling; cotton bad.	
	Nassick	"	...	...	Early crops middling; late not flourishing: cotton prospects bad.	
	Deccan	"	...	...	Cotton prospects discouraging; late crops failed in places and withering.	
	Southern Maratha Country	"	...	...	Cotton generally middling: late crops withering in Kullaghee; elsewhere partially good.	
Bengal	Dacca Division	December 6	Nil.	December 20	Rice nearly all cut; winter crops promise well.	
	Patna "	"	"	"	All going on well.	
	Burdwan "	"	"	"	Aman reaped. Winter crops good.	
	Cuttack "	"	"	"	Prospects of crops generally good. Almost total failure has, however, been reported from Purkood, Malood, and Budgerkote between the Chilka Lake and the sea. People very badly off, with neither food nor money to buy.	Loan to Parikood Rajah for Rs. 10,000 applied for by the Commissioner to be expended on works and improvements. Advance of Rs. 1,000 on this account has been sanctioned.
N. W. Provinces	...	...	Nil.	December 21	Crops as before.	
Punjab	Delhi	December 20	Nil.	"	Weather cloudy, rain much wanted.	The weather has been cloudy for the last few days; a good general fall of rain now would be of inestimable value.
	Umballa	"	Nil.	...	Rain much wanted; agricultural prospects gloomy.	
	Jullundhur	"	Nil.	...	A good fall now would be in time for crops on favorable soils.	
	Lahore	"	Nil.	...	Season for sowings on unirrigated lands almost past: great scarcity of fodder.	
	Mooltan	"	Nil.	...	Agricultural prospects same as before; cattle disease prevails in Tehsil Serai Sidhu.	
	Rawul Pindee	"	Nil.	...	Crops suffering.	
	Peshawur	"	Nil.	...	Rabbee sowings progressing.	

SEASON REPORTS, DECEMBER 1871.

Presidency or Province.	District.	Date of District Report.	Rain-fall for fortnight preceding.	Date of Report from Local Government or Administration.	State of Agricultural prospects.	Remarks of Local Government or Administration.
Oudh	Lucknow and Fyzabad... ...	"	Nil.	December 21	... ...	The Chief Commissioner observes that the rubbee prospects throughout the province are favourable. The usual Christmas rain is wanted in parts. In the meantime the young wheat is being irrigated. Weather somewhat cloudy.
Central Provinces	Raipore	December 18	Nil.	December 21	Rubbee prospects depend on the usual winter rains; should these fail a very short crop will be obtained.	In the Nagpore and Chattesgurh Divisions the rubbee crops will fall short of the average crop if rain ceases; it has held off too long. In the Jubbulpore and Nerbudda Divisions prospects are more favourable, but rain is wanted everywhere.
	Bilaspore	.....	Nil.	.....	Occasionally cloudy; rice nearly harvested; hada, oilseeds and others reaping; rubbee crops require rain.	
	Sambulpore	.....	Nil.	.....	Rice harvest much below the average.	
	Nagpore	December 20	Nil.	.....	Cloudy weather for some days has affected the khureef and rubbee crops; jowaree and tur harvest poor; rice partially failed; rubbee wheat in some places drying for want of moisture; gram and lak slightly injured; prices of grain falling.	
	Wardha	.. ..	...	.....	Khureef crops fair; cotton good; some anxiety for rubbee crops from absence of rain.	
	Jubbulpore	December 20	Nil.	.....	Prospects of rubbee in good soils promising, but rain is needed; weather cloudy. Cattle-disease prevalent in Mundla and Jubbulpore.	
	Hoshungabad	.....	Nil.	.....	Prospects continue favourable; a little rain would do good.	
	Baitool	...	...	.....	Same as above.	
	Nimar	.. .	...	.....	Khureef good, rubbee bad.	
	Nursingpore	....	...	.. ..	The want of rain and the cloudy weather are affecting the rubbee crops.	
Hydrabad Assigned Districts.	East Berar	December 21	Nil.	December 21	In the southern portion of Gomrawuttee District the Commissioner says he sees the rubbee crops withering. The short fall of rain, absence of dew, and the recent great heat are destroying them. However, the percentage of rubbee to the total cultivation is small. In the Woon District also, in the north of the district, prospects fail. Christmas rains are hoped for.	
	West Berar	" 18	"	" 20 ...	No rain, and consequently no improvement in agricultural prospects. Khureef almost reaped. Rubbee crops suffering from want of rain.	
Central India ...	Indore	December 20	Nil.	" 21 ...	Prospects in Malwa are fair, but southwards and below the Vindyhas the want of rain is much felt, and the wells have little in them.	
	Gwalior	"	...	.....	Weather changeable; rain wanted.	
	Rutlam	.. ...	...	.....	No return.	
	Baghelcund	...	...	.....		
British Burmah	Akyab	December 20	0·7	December 21	Crops in good condition.	
	Rangoon	"	Nil.	.....	No change in crops.	
	Thayetmyoo	"	Nil.	.....	Fair.	
	Toungboo	"	0·16	.....	No alteration.	
	Amherst	"	Nil.	.....	Most part of crops reaped; no damage since last report.	
Mysore and Coorg ..	Bangalore	" 21	*0·25	December 21	Crops favourable; ragi harvested; paddy being reaped.	* Very little rain in the district and only twenty-five cents in the Bangalore Cantonment. ‡ Agricultural prospects good.
	Mysore	" 19	Nil.	.....	Crops thriving throughout the district.	
	Coorg	" 21	Nil.	.....	Paddy ripening fast and a good crop generally expected; reaping has commenced in some parts of South Coorg; horse and Bengal gram crops thriving; coffee berries being picked on European estates.	

The Planters' Gazette.

BOMBAY, 22ND JANUARY 1872.

THE ESTATES.

THE *Indian Statesman* makes the following observations upon the present system of pruning coffee in India :—

"THE growth of coffee in India has been so unfortunate an enterprise hitherto, that planters would do well, we think, to review closely every step of the system upon which they have hitherto gone. Are they quite sure, for instance, that their present system of *pruning* is correct? That it is a direct of interference with the natural development the tree is admitted. Are the planters then quite sure that this interference is not carried too far? A late visitor to the Neilgherry Plantations, writes :—

"My impressions, whilst riding or strolling through the different fields of coffee on this splendid property, were those of admiration at the vigour and luxurious growth of the tree, the dark glossy green of its leaves, and the uniform healthy appearance of the whole, *but I was much struck* and surprised at seeing so little fruit. I believe the crop on the trees will not exceed 5 cwts. an acre all round, even if it reaches that low figure; and this estimate was endorsed and confirmed by my companion, a planter of 15 years' experience. This small yield seems attributable to the system of pruning now in vogue in the district, by which the very best parts of the tree are cut away; this is followed by what is elsewhere properly termed "handling," but here the knife is again used, and melancholy indeed is the effect upon the condition of the tree. It is matter for very grave consideration how much this system of pruning has to do with light crops. It is undeniable that *judicious* pruning has a wonderful and surprising effect on the bearing capabilities of the coffee tree, but climate, soil, and the seasons, exercise a greater influence in producing crops, and I venture to affirm, that if less wood were taken from the trees and more done in the way of cultivation, *i. e.*, trenching, terracing, renovating pits, &c., that the soil of this estate, with the stamina which it possesses, together with the natural advantages of its climate, would yield an average of 10 cwts. an acre for the next quarter of a century, without exhaustion, and with double profit to its owners."

We commend these suggestions to the attention of the planter. It is quite within the range of likelihood, that in remorselessly pruning the tree down to a convenient height for 'picking,' its fruit-bearing powers may be seriously interfered with."

For further information upon this question of pruning coffee trees we refer our readers to the back number of this journal for September 1870, wherein the subject was discussed by several correspondents.

TEA ESTATES.

THE *Darjeeling News*, in taking a retrospective view of the general agriculture of the district during the past year, says:—

One of the most noticeable features, perhaps the first, that strikes us on looking around Darjeeling is, that while our monsoons are characterised by an unabated heavy rainfall and our winters continue to be severe,—severe enough to render good fires indispensible in our dwellings, many of the hill sides in the vicinity of the station are beginning to look miserably bald owing to the rapid clearance of their covering of ancient forest timber, the timber which a few years ago it was doubtless imagined would afford a practically inexhaustible supply of the needed firewood. This alarming denuding of our hill sides, directly consequent on the clearing of ground for the irrepressible tea plant, has already told seriously on the selling price of firewood which has risen 25 per cent. in the station within the year. Let us note this now, for as time runs on firewood must necessarily become a seriously expensive item in our domestic economics, unless our expected railway brings with it coal to our rescue! The Forest Department it is true, has large reserves of forest land in the district; and the Darjeeling Municipality is still in the ownership of a most picturesque forest close to the station—but to cut down that forest would be a mortal sin—and we dont know that the Forest Department have as yet founded any definite intentions respecting its preserves.

Passing on from forests to the at present all-prevailing industry of these hills, tea cultivation, we are glad to note the general verdict—that it flourishes. The progress in the year which is just about to expire, has, perhaps, been less apparent because less spasmodic, but probably more real than in many of the years which have preceded it. The prices of this season's crops have, on the whole, maintained a favourable stand, and the time seems to be at hand for capitalists to declare, with truthful confidence, that tea growing here must be regarded as one of the remunerative "developments" of British enterprise. The rapidly increasing employment of machinery in tea houses may also be regarded as significant of the *permanent* character of the investments made in the tea spec, and with rare and insignificant exceptions the gambling spirit in which so many speculators made their first rush at tea has disappeared. We are bound to say, indeed, that none of the Darjeeling planters now-a-days look upon their business as other than that in which their future income for life must be obtained. Tea manufacturing is no longer the temporary task from the performance of which a sudden and rapid fortune can be made, by a "clever" sale of stock and block, at an exorbitant price.

In some few instances lately comparisons have been instituted between the Darjeeling and the Assam and Cachar teas, showing unfavourably for Darjeeling. But while we are inclined to suspect that this is partly due to the existence of unworthy jealousies, or party-spirit in trade rivalry, its wholesome effect on our Darjeeling planters ought undoubtedly to be the prompting to renewed enquiry into the cause of shortcoming and of excellence, and increased activity in the effort to excel.

The cinchona gardens, both those of Government and of the Cinchona Association, are reported to be doing well, and the former has lately passed into the charge of a new Superintendent, Dr. George King. We have not yet heard what success has attended his efforts in manufacturing quinine, but we apprehend that this branch of the business will tax the utmost skill of the best manipulative chemists in the service of Government.

TEA.

THE prospects of tea-planting in these provinces are brightening. We have heard of a large parcel of green tea from the Western Dhoon, comprising four qualities, being sold lately at rates which gave over three shillings per lb. for the higher sorts, two shillings nine pence for medium, and two shillings two pence for the worst. We need not say that these prices are splendidly remunerative.—*Pioneer.*

PRUNING OF TEA :—BY GEORGE KING, M.D., F.L.S., LATE DEPUTY CONSERVATOR OF FORESTS, KUMAON.

(From the Journal of the Agricultural and Horticultural Society of India, Vol. III., Part 1.)

LET us now consider for a little what the systematic "plucking" of the tea plant really amounts to, and what it is that the planter demands of the bushes in his garden. In the operation of "plucking" the plant is regularly deprived, during the season of active vegetative activity each year, of its young expanding leaves, and of the growing extremities of its branches. In other words, it is systematically deprived of the parts that are at once the organs of its digestion and the instruments of its growth, as fast as it provides itself with them. Were the deprivation complete, the plant would simply die. But, even in the most over-plucked plantations, it is only partial. Not only however does the planter thus continuously deprive the plant to a serious extent of the very organs of its life and growth, but he demands that it shall continue for a series of years to be submitted to this process, and still to continue healthy and vigorous, or as he phrases it, to give good "flushes." Observe too the kind of leaves that the planter chooses to pluck. They are not old mature leaves, whose vital functions are sluggishly performed, and whose best days have past. The tea plant being an evergreen, a large proportion of such might be removed without injury. It is not these however that are taken; but the young and growing, in which sap circulation is rapid and free, in which the vital processes are carried on with vigour, and to which the young branches bearing them, and indeed the whole plant look chiefly for the materials of life. Where, as in the North-West Provinces of India, the planter has asked the plant to yield up these for a succession of years, while he on his part has given but small help in the way of manure and tillage, and denied even the cheap aid of the pruning-knife, it is not to be wondered at that tea planting has proved unsuccessful.

Inasmuch as the plant is a perennial one, from which are annually gathered the magnificent growing leaves, the tea crop differs from every other with which we are familiar, except perhaps mulberry, which, as food for silk-worms, is also grown for its leaves. Most garden vegetable crops of which the leaves are the parts gathered, are the produce of plants which are expected only to yield a return to the grower once in their lives, (*e. g.*, Cabbage); or a return for a short season, (*e. g.*, Brussel's Sprouts), and then to die. They therefore present no parallel case to that of tea. The returns desiderated in other perennial cultivations than tea, are usually flowers or fruit, (or what is the same thing—seed), but never young leaves. Now the bearing of flowers and fruit is the natural consummation of a plant's life, and the removal of these, after they have been produced, does no harm to the producing plant *as an individual*, (on the contrary often benefits it), although the act affects its possible posterity. It is true that, in order to force it to bear unnatural quantities of flowers and fruit, or flowers and fruit possessing unnatural qualities, the horticulturalist often exposes a plant to treatment which is injurious to it as an *individual*, and which leads to premature old age; at the same time it is treatment which, as regards flowers or fruit, is the most advantageous. In contrast to this is the action of the tea grower who, by the very collection of this crop, necessarily exposes his plants to treatment which, as regards a continuation of that crop, is disadvantageous.

In the cultivation of almost all kinds of fruit trees, the operation of pruning holds a prominent place. The problems respectively presented to the European grower of fruit and flowers, and to the Indian cultivator of tea, being different, it is only reasonable to expect that different methods of practising that operation would be advisable. The general practice of pruning, as carried on by European gardeners, is however founded, for the most part, upon a knowledge of the principles of vegetable physiology, and it is therefore also reasonable to suppose that Indian tea growers might have learnt a good deal on the general subject of pruning from European writers on gardening, even although not venturing to put their plantations under the charge of practical European gardeners, with full powers to do as they might deem best. Until within a year or two ago, however, the only kind of pruning attempted in the tea gardens of the North-West Provinces was the removal of wood actually dead, and the application, on rare occasions, of a hedge-clipping scissors, which delicate implement used to be entrusted to a native gardener (malee), with orders to reduce, by its means, certain bushes to a particular height, a stick of the required length being given to him as a measure. Indiscriminating treatment like this is the kind of pruning to which a few gardens in these provinces used now and then to be submitted. Rational pruning involves consideration and selection; and each bush ought to be treated according to its own individual condition, and not in accordance with a rule of thumb laid down for an entire field or garden. It is only certain stems and branches to which, as a rule, the knife can be applied with advantage, and these for the most part are the ones that afford the most marked examples of the natural effects of "plucking." Now if we think of the matter for a little, the process of "plucking" will be seen to be really of the nature of *pruning*, and to recommend pruning as a cure for the evils of plucking, may therefore appear paradoxical. To explain the seeming paradox, let us consider briefly the appearances presented by a young shoot of tea before it has been deprived by the plucker of its tip with the three or four leaves or leaf-buds born thereon. Such a shoot bears on its entire length let us say, ten leaves, and at the point where each leaf springs from the stem (*i. e.*, at the *axil**) there lies a small bud. Each of these buds is capable of development into a lateral branchlet. In a branch bearing as we have supposed ten leaves, it is not probable that, were things left to their natural course, each of the ten axillary buds would become developed into a lateral branchlet. When however the growing point of the shoot is removed, these axillary buds are stimulated by the ascending sap, and most of them expand into lateral branchlets, and these being in turn topped by the plucker, their axillary buds are stimulated, though in a less degree, into expansion into branchlets, and so on. The vigour with which lateral branchlets follow on "plucking" or topping the leaders, diminishes regularly with each repetition of the process, until after a few years of such treatment, a period of nearly complete stagnation is reached, and the original ten-leafed shoot, with which we started, presents the appearance of a tough greyish-barked and often gnarled stem, bearing at its top a dense collection of small wiry twigs, which carry a quantity of small thin tough leaves totally unfitted for manufacture into good tea. These twigs moreover are of such low vitality that when topped they hardly respond by throwing out fresh lateral shoots or "flushes." This is the kind of stem of which the clumps of unpruned tea already described consist. The reason of the smallness and non-activity of the leaves upon these brush-like masses, is simply that they have increased in number out of proportion to their means of nourishment. The stem, through the sap-wood layer of which their nourishment is transmitted, has not increased proportionally with the number of the leaves which have been forced into existence by the operation of plucking; and it is a physical impossibility that, through the layer of sap-wood in the stem, there can be transmitted enough sap to support many young leaves, in addition to the old ones with which its top is crowded. Were such a stem left to itself, and all plucking suspended for a time, it is probable that in some cases an equilibrium would be established between the leaves and sap-wood, and that the latter would again become extensive enough for the transmission of sap sufficient to support a natural succession of young leaves, or in other words, to "yield flushes." But the process of recovery would involve time, which to the tea planter means money. A quicker way therefore of obtaining leaf must be tried, and this is found in pruning off the profitless wiry spray with which the stem is crowned, so that the sap transmitted upwards may cease to be dissipated away in the support of leaves which can never be made into tea, but which as long as they remain on the plant must have their needful supply of sap; and further, that the sap may be directed into the new shoots which the plant may be expected to throw out after the pruning. It is thus that pruning becomes the necessary sequence of plucking, if healthy young leaves, fit for tea-making, are sought to be continuously produced. The end in view should never be lost sight of when using the knife, for the mere meaningless mutilation of a plant by its application, is quite as likely to be hurtful as not.

It is extremely difficult to get native workmen to understand the kind of stems and branches they are to remove, and it will require much ingenuity and care and incessant watchfulness on the part of a manager to keep them from doing harm. As is the the case with many other matters, it is infinitely easier to prune badly than to prune well; but there are few operations where the difference in results between bad and good work is more striking. In order to prune really well, each clump ought (as has already been said) to be treated on its own merits; but as it is pretty nearly hopeless to think of getting native workmen who are capable of doing this, it would be necessary for the manager (after having clearly defined to himself what it is that he wants to effect, and the best way of doing it) to give his pruners a general idea of the kind of measures suitable for each patch of tea in the garden as they come to go over it, illustrating to them practically what kind of stems and branches should be cut quite away, what kind should be merely trimmed, and what left entirely untouched.

It might be safely impressed on tea pruners as a fundamental maxim, *that old wood is to be cut away within a few inches from the root*, for it will generally be found that such wood bears no leaves of which good tea can be made, but merely the small thin sluggish sort that are carried by the broom-like masses of spray already described. As a rule then, the best thing that can be done with hard old stems is to cut them off low down, in the hope that fresh new shoots may, as a result, spring from the root or from the collar, as gardeners phrase it. By the removal of these, not only are a quantity of useless leaves prevented from preying on the sap, but light and air are secured for the young shoots that will spring up. In old unpruned plantations, or on such as have been over-plucked, the proportion of such broom-bearing old stems is very great. Clumps formed of them are often very handsome and healthy-looking, and thus are very deceptive. If a large clump be entirely composed of such brooms, it is a question whether a certain number of them should not be spared until a succeeding year, to carry on, as it were, the life-work of the plants, and not to trust entirely to the new start in life which a clean sweep of all would necessarily involve. When we consider the influence that leaves have in promoting the collection and transmission upwards of the crude sap, it does appear more rational to leave a certain number of these old stems for one season, so that by their means, sap may be attracted and elaborated for the benefit of the young root-shoots which may be expected to appear as the successors of the stems that may be removed. Stems thus spared ought however to be cut away in the next year, by which time the young shoots will have acquired some size, and will carry a number of leaves. If the mode be adopted of at once cutting down to the root the entire clump, the pruner of course accepts the chance of the roots sending up no young shoots at all, and therefore dying, a result which for reasons above explained, is quite possible, and the possibility of which should always be borne in mind.

In tea growing in unsuitable localities or in poor soil, and in tea which has been prematurely plucked, it is often the case that each stem in a clump represents a plant, (in other words that a plant consists of but one stem), and to prune entirely away such a stem would therefore be to cut down or cappice an entire plant which, as we have just seen, is to run the risk of killing it. A wise precaution in dealing with such weakly clumps would be, *first* to deep-hoe and manure the soil round them, so as to get them into a little better heart, then to prune gently, and finally to cut down by the root during the succeeding cold weather. It is of course a question whether it would not be cheaper in dealing with such unhealthy tea to run all risks, and to cut it down to the ground at once.

The old hard stems of which we have been treating may easily be recognised by the appearance of their bark, which, often gnarled, lichen-grown, and warty, is always grey in colour. Younger stems, on the other hand, are of a brownish colour, and often marked with

* Derived from the Latin word *axilla*, the arm-pit.

dark lines. If a clump is very thick and close, and the young stems are twiggy above and yield small leaves, some of them may be cut away by the root, but the majority of young stems should, as a rule, merely be trimmed a little by being relieved of their most wiry twigs.

In many clumps, there will be found springing straight from the root, a few long lanky shoots, which bear their leaves far apart, and do not branch. These have probably been unnaturally "drawn up," owing to want of air and light. They are never likely to be of much use, and if in the way should be removed.

Young and vigorous stems ought not to be touched with the knife.

It is not necessary to go into details with regard to the treatment of younger clumps of tea which have not been over-plucked, and which therefore do not abound in broom-bearing stems.

The general principles already insisted upon should be carried out, and after the pruner has finished with it, each clump ought to consist of young healthy stems with fresh-looking bark which do not branch too much, nor end in the wiry spray so often alluded to. The height and circumference of clumps will depend on their age, and on site and soil. Each clump should be open and sparse enough to admit air and light to its centre, and no particular form should be insisted on as a pattern to which all are to be made to conform. Each should, on the contrary, be of the form most suitable to its condition and requirements. Experience alone will teach the comparative severity or lightness of pruning which will be most advantageous to the different varieties of the plant, and in different soils and situations. Generally pruning should be done when the sap is down and the plant is at rest, which with the tea plant is the case in the cold weather. The rains having ceased, and the ground during the early part of the cold weather having been deeply hoed and manured, whatever pruning is contemplated ought to be begun at once, and finished with all convenient speed, so that the plants may have time to recover themselves before the sap begins to rise and the flushes to appear.

The frequency with which this operation is to be repeated must be determined by the condition of the plants, but probably a light pruning would be advantageous every year, if it could be managed.

Pruning, such as has been recommended, cannot be practised successfully on one set of bushes for ever. A time must arrive when they will cease to respond to the calls upon them, and to begin to yield but poor and small leaf, and little of it. Entire exhaustion will eventually follow, but we have yet to learn how long, under such a system, they will continue to yield *profitably*. With generous treatment they may probably do so until they are 15 or 20 years of age, or even older; but the wise planter will provide for the future by laying down year by year new patches of bushes to succeed the old.

It has not been the object of this paper to treat of other matters connected with tea cultivation. I would merely say, in conclusion, that to ensure success, pruning must go hand in hand with deep hoeing, careful weeding, and manuring. If these, the essentials of all gardening and farming be attended to, and intelligent efforts be made to get good seed-bearers, if a system of closer planting than now prevails be adopted, if rational plucking be practised, and increased care be taken in the manufacture for the market, there is every reason to believe that tea growing in the North-West Provinces of India may yet become a great and successful enterprise.

IPECACUANHA.

From the Assistant Conservator of Forests, to the Government Quinologist, Ootacamund, dated Nellumboor, 17th October 1871.

I HAVE the honour to report, for your information, the particulars noted regarding the growth of the Ipecacuanha plants under my charge. Best plant 10 inches in height, inclusive of double tops (each 4½ inches in length), one of which has also again doubled. Each leader 2½ inches in length, and in July a shoot from the root appeared, which is now 3½ inches in height. This plant is most thriving and healthy. The other plant has improved greatly during the rain, and is 5½ inches in height, fresh and healthy, although not so forward as the other.

Both plants flowered abundantly. The large plant only produced seed which failed to germinate. Major Beddome, Conservator of Forests, when here in January last, saw the seeds and said from what is known of the plant it could hardly be expected to germinate. However, the plants being more established and acclimatized, I am sanguine the next seeds will prove a success. Meanthime it is very satisfactory to see the marked improvement in the growth of both plants.

COFFEE.

PROGRESS OF COFFEE PLANTING IN DIMBULA.

A planter who has taken the trouble to collate the information, informs us that during the present season there will not be less than from 3,000 to 7,000 acres of forest land felled and planted in Dimboola. We suppose between the three districts of Dimboola, Dickoya, and Maskeliya, the addition to the planted extent of coffee will not be far short of 10,000 acres, which three years hence may be expected to add 50,000 cwts. to our coffee exports, rising by-and-bye to 80,000.

SALE OF FOREST LAND IN DIMBULA.

Probably the last sale of Crown lands for coffee planting purposes which will take place during Sir Hercules Robinson's administration came off at the Kandy Kutcherry yesterday; and the result ought to satisfy the Governor that the most sanguine account he may choose to give to the Secretary of State, of the value of Crown forest land suitable for coffee and of the greatly-increased price which would be given for it were the Ouvah railway (through Dimbula or Dickoya) only announced, will be amply justified by the experience of future sales. We have a graphic account of the scene—no ordinary one—in Kandy and at the Kutcherry there yesterday. There were only three blocks of land—one of 184 acres, one of 322, and one of 458 acres—to be sold, and yet as planter after planter came riding or driving into town, it seemed as if all Dimbula had been deserted for the occasion, besides there being visitors from other districts. The meeting of the competitors is said to have been the most dismal affair possible—they all seemed like attendants on a funeral—and each fresh arrival produced not a smile, or a word of welcome, but a further lengthening of the countenance, and a more dismal look all round. In the verandah of the Kutcherry there could not be less than a dozen earnest bidders (among the many others not so flush of money) after three blocks of land. But then such fine land, even for Dimbula! We are assured by an impartial authority that the 320 acres comprise as fine a piece of land as could possibly be desired by any coffee-planter in the country, and the other two were nearly as good. The bidding was animated: in one case a block after running up gradually to £500 was at one stroke raised to £900 by an enterprising bidder who thought his antagonists would be driven out of the field, but in vain. The result of the sale was that the largest block of 458 acres was sold to Messrs. A. L. Cross and G. M. Ballardie for £1,655 being at the rate of £3 12*s.* 3*d.*, per acre, and that of 320 acres to Mr. L. St. Geo. Carey for £1,550 equivalent to £4 16*s.* 10*d.*, per acre; while the remaining one of 184 acres was purchased at £4 5*s.*, per acre for £750 by Mr. Wm. Northway. Thus for an aggregate of 962 acres of forest land, the Government has received no less than £3,955, being at the rate of £4-2*s.* per acre without counting survey fees or cost of title-deeds to the purchasers. With such prices and the present prospects for coffee-planting, not a day should be lost in dealing with the question of Railway Extension.

PRODUCTION AND CONSUMPTION OF COFFEE.

A perusal of the article on this subject, taken from the London *Grocer*, ought to cheer the hearts of despondent planters and planting agents in the midst of the present short crops. The concurrence of testimony from all quarters, with reference to the great deficiency in the supply of coffee for the coming year, and the difficulty of producers to keep pace with the consumption for many years henceforward, is simply irresistible. Every acre of coffee-land, worthy of cultivation in Ceylon, ought to rise in value considerably, and the forbearance of capitalists towards their debtors with over-drawn accounts, should never be asked for more successfully. There are undoubtedly "good times coming" for the Ceylon coffee planters, and we trust the men still amongst them, who have borne 'the burden and heat of the day' for a long series of years back will, at length, meet with the due reward of their labours.

COFFEE: ITS PRODUCTION, CONSUMPTION, &c.

(*From the Grocer, Nov. 11th.*)

THE recent extraordinary rise in the price of coffee has (according to the *New York Shipping List*) produced much discussion in American commercial circles. The price of good Rio in cargo, for instance, has within a few weeks advanced from 11½c. to nearly 17c. per lb., and other descriptions of coffee have risen nearly as much. A glance at the history of the coffee trade and at the influences which have brought about the recent changes in price will be interesting at this time, when this sudden and great advance in price, indicating a scarcity of coffee, is followed by recent news from Brazil, the chief producing country, that the Legislature has passed the Bill for emancipating the slaves. The abolition of slavery in the British West Indies contributed, among other circumstances, to disturb the regular production of coffee. Soon after, in 1837, the West Indies, not including Hayti, produced 49,000 tons, while the Dutch East Indies produced 20,000 tons. The total production of the world was 142,000 tons.

In 1851 the proportion was as follows:—West Indies, 20,000; Dutch East Indies, 82,000; total product, 275,000 tons. In 1868 the change of relations appears still more remarkable:—West Indies, 8,000; Dutch East Indies, 98,000; total, 242,500 tons. The West India plantations were long neglected by their owners, who lived in Europe, leaving them to overseers. Coffee culture requires constant attention and cheap labour. It is not strange therefore that it sought more congenial regions. The Government supervision and the coolie labour of Java and Ceylon were well suited to it. In Java and Padang the East India Company knew how to produce the best coffee at the cheapest rates. Ceylon rose from a production of 32,000 cwts. in 1837 to ten times as much in 1851, and this is again trebled in the present short crop. Java, more subject to droughts and devastating storms, fluctuated a good deal more in supplying the markets. The lowest point reached was 15,000 tons in 1833, and the highest point was 77,000 tons in 1845. The average yearly product during the four successive decades of years, from 1851 to 1871, has been 37,000, 58,000, 61,000, and 55,000 tons respectively. The Brazils, with abundant black labour, in the meantime rose to prominence in the coffee market. Beginning with 1821, the average production per year during the four following periods of ten years was 19,000, 49,000, 97,000, and 144,000 tons. The average then fell off to 128,000 tons during the seven years after 1861.

Among the coffee-producing countries, near the United States, the production of sugar has been encroaching in a remarkable manner on that of coffee. The value of sugar only 1½d. per lb. on the plantation in 1847, has been quadrupled since that time, while the value of coffee has only been doubled. Two influences have tended to the advance—the abolition of slavery in the West Indies already mentioned, and the depreciation of gold. In Cuba, if we except the Santiago district, coffee cultivation has ceased altogether; and in other islands, except in Porto Rico, it has continued with varying and uncertain results. This change of the field of production is unquestionably a very important fact. When the production was scattered over the world, we were less subject to the chances of a "short crop," because the local influences of one part of the world would not be felt in another. Now, however, the production is confined to the Brazils and two large islands in the Indian Ocean. A favourable or unfavourable season in any one of these coffee-raising countries, produces a marked effect in the amount and price of the staple. To this cause of fluctuation must be added the uncertainty as to the renewal of the Dutch East India Company's charter. If the charter be not renewed, labour complications in Java will follow, the auction sales may cease, and the vessels of all nations will come into competition with those of the Dutch merchants, which are now employed in regular order. This would produce irregularity in transportation. It is an interesting fact that in Europe the consumption of coffee has increased slowly, varying with the price and the duties imposed, and ranging from 1 lb. for each person in England to 11 lbs. in Holland. In America the consumption in 1821 was 1 lb. 4 oz. for each person: in 1839, 6 lbs.; in 1851, 8½ lbs. The total consumption in 1842 was 67,000 tons; in 1862 it was only 40,000 tons; and last year it was 124,000 tons. In 1851, Europe consumed 186,000; and the United States, 70,000; total, 22,000 tons. In 1867 the proportion was as follows:—Europe, 282,000; United States, 92,000; total, 374,000 tons. In 1870, Europe, 347,000; United States, 124,000; total, 471,000 tons. If the American population numbers 100,000,000 in the year 1900, as many predict, they should consume at the present rate per person (nearly 8 lbs.) 357,000 tons of coffee. The consumption in America has rapidly increased of late, on account of the lower duty, and the great demand of the coloured population in the Southern States. This demand is principally for Rio. The increased demand among the whites is mostly for Java and Maracaibo. The consumption will be checked, of course, by the rise in value.

As emancipation is now imminent in the Brazils, we must be prepared for a low production in the future, especially if the slaves are suddenly liberated. If the coffee-production of a country is once interrupted, it requires time to fill the vacancy in the market, because the coffee tree does not begin to bear until its 5th year. High values produced by interruption are more permanent, therefore, in the coffee trade than in any other, except in the case of certain spices. The estimates of the short crops, however, which are now finished and published must not be taken with too much credulity, as the range of area under cultivation is so large that it is impossible to judge of the crop with accuracy. The lowest estimates of the deficiency of the crop, now given by intelligent students of the subject, are as follows:—For the Brazils, 70,000; for Java, 20,000; for Ceylon, 10,000 tons—a total estimated deficit of 100,000 tons.

The weather is now hard and dry. Hot days and high winds, with cold mornings, have prevailed for the past ten days, and Christmas day for a wonder promises to be dry this year. *Low crops* are finished and high ones all but, both high and low, are a sad disappointment; and owners, agents, and managers, after repeated reductions of original and altered estimates, are now obliged to bear witness to the melancholy fact that they have been deceived by appearances. To such an extent has this gone that many well-known properties, well cultivated too, are giving one-fourth and one-fifth of their average yield. Hence we find even since crop began, estimates have been twice and in some cases three times reduced. As a consequence too conjecture is free and out-spoken as to the probable total out-turn of our export of this season, which it is now thought by many will not exceed 600,000 cwts. Acre for acre, I believe, this will be the shortest yield our island has ever given. Fortunately the price keeps up. But no price we can look for will compensate for such an awful deficiency in quantity. The cause of this deficiency is not far to seek. The land, as before shewn in these reports, is taking its periodical rest. And all the manure we can apply, and all the cultivation we can bestow, will not prevent its requiring and taking this rest. Is it not so in England and other European countries? and are not farmers discovering that, notwithstanding their boasted rotation of crops and of manures, the land requires a rest; nor in this a new thing, was it not so in earliest times? What do we read in Exodus chapter 23 and at verses 10 and 11? "And six years "shalt thou sow thy land, and shalt gather in the fruits thereof. "But the seventh year thou shalt let it rest and lie still; that the "poor of thy people may eat, and what they leave the beasts of "the field shall eat. In like manner shalt thou deal with thy "vineyard and with thy olive-yard."

If, owing to a difference in our tropical soil and seasons, the land continues to bear crops for ten or eleven years on end, we find it squares itself with us by taking two successive years of rest, as we see it has done regularly during three decades: seasons out of joint, and leaf disease, seem but auxiliaries to this necessary condition of all lands—*periodical rests*.

The leaf disease appears to be wearing itself out, and green is again becoming the prevailing colour. Estates are rehabilitating themselves quicker than usual after crop, and indeed well they may, having done so little to hurt themselves with the present crop. The spirit in the price of coffee has given a stimulus to the recultivation of many a patch along road-sides, and it is amusing to see with what vigour the owners of such bits are working up gardens that have been neglected for years. Where bare sticks only were visible a month or two ago, they are now brushed up and are getting tipped with green.

Blossoming has begun to shew on low lands. It will be a sprinkling of crop next July. During the last week arrivals of coffee both Native and Plantation in the central capital have got scantier daily, and the end cannot be distant.

Health in the whole is good.

Labour is plentiful, and soon it will be paid off in large quantities.

Rice is still dear, and it will likely be so till February when the next crop will begin to arrive.

In the report of our correspondent in the last issue of the *Overland Observer*, a mistake occurs; the estimate for 1872-73 should be 1,200,000 cwts. instead of 200,000 cwts.

CEYLON COFFEE SOILS.

Memo. of particulars of samples of Soils, &c., sent to England for Analysis.

"LOOLE CONDERA" AND "WALOYA."

Extract from letter from James Taylor, Esq., to Messrs. Keir Dundas & Co.

In filling the boxes of soil, I dug a hole, about the same width as the box, filling the box by stages of an inch or two with earth from corresponding depths in the hole. Thus if a side of the box is taken out, a section of the soil as it is in the field will be seen nearly correct to the depth of fully a foot. The surface soil is at the end of the boxes marked TOP. I may mention that the bulk of the small feeding roots of the coffee are within generally two or three inches of the surface of the ground.

W. M. L.

The box marked L. C. *a*. contains a sample of branches with the berries and leaves on, from

W. M. L.

trees *under* bearing, and the box marked L. C. *b*. contains a sample with berries and all the leaves off from trees over-bearing, and unable to ripen the crop properly, although it is only a small crop.

The sample *a* is from good soil, same as in the

W. M. L.

box of soil marked L. C. 3. and taken from the same place. The sample *b* is from exhausted soil, a sample of which is contained in the box marked W. M. L.

L. C. 4. There are but few trees in the place that sample *a* is taken from, which have not a very much thicker crop than shown

by the sample, and these few trees *under* bearing, will have a very much larger crop next year. On some of the branches of sample *a*, will be found specimens of the coffee bug, that is the black bug, but not in quantity to have done harm. My idea in selecting these two samples is, that in the bad sample *b*, something may be found deficient, the want of which prevents the berries from ripening properly and accounts for the sickly and nearly leafless-state of the trees when maturing crop. The berries on the branches, sample *a*, being from trees *under* bearing, and from excellent soil, might be expected to contain an ample supply of all necessary materials. It might be useful to know what difference there is between the ingredients of these two samples. Perhaps the difference may be found more between the ash of the branches and leaves of the two samples than between that of the berries. The berries in the bad sample may have absorbed nearly as much mineral matter from the branches as they want. The cause of their not ripening being the unhealthiness of the branches, and scarcity of leaves thus produced. In sample *a*, I should suppose that berries, leaves, and branches, will contain everything they want in abundance; but I hardly think the samples are large enough to allow of the branches and berries being analysed separately, and I should think that there might be a general deficiency shown by sample *b*, taken altogether as compared with sample *a*. In some respects it would be interesting to know the proportion of ash from equal weights of the two samples. In case of there being no great difference between materials of the ashes, the proportion of the quantities of ashes might help to guide us to an explanation of how they come to differ. Comparing the analysis of the two samples of soils, from which the samples of branches are taken, with the analysis of the branches, might also help to throw light on the matter. The samples of soil I took to Kandy the other day, are as follows:—

W. M. L.

L. C. 1. Is fresh soil from the forest: it is a soil in which I know coffee would grow well, and bear good crops for many years without manure.

L. C. 2. Is from clearing which has been felled and burned off, for a year and a half, on which nothing has grown yet (since burning off) it being just recently planted with tea. I should like this sample compared with the first sample, to see what difference the burning of the forest makes to the soil by adding its ashes; say also, if practicable, to see what effect exposure to the sun may have on the soil, say by exhausting the organic matter in it perhaps. Coffee does not grow well here, especially in black soil, when there has been no burn, as on places where the felled forest has been carried off the land, or on places that have not got covered with it in felling, the young plants on such places are often very sickly for years after planting, but eventually grow all right. Young coffee plants usually grow better the sooner they are planted in the field after burning off the forest. Seeing that potash applied to young coffee plants in the shape of saltpetre seems to have no effect, I am inclined to think that a good burn of the forest causes the young coffee to grow better by the alkali of the ashes destroying acids in the soil. Black soil up in this cool climate, and of a peaty nature, might contain some such noxious properties, and other jungle soils in a less degree.

L. C. 3. Is a fine black soil, in which coffee has borne heavy crops for many years, and in which the coffee is still as good, perhaps as never was, and will be good, I have no doubt, for very many years to come without any manure. It is from a very stony rocky place which has never been manured. Both the former samples are also of black soils. This sample might be compared with the two former, to see if it is still as rich as they are in necessary materials. Any deficiency as yet has certainly not deteriorated the coffee much, though no doubt, were the soil to be re-planted with young coffee trees, they would not grow well.

C. L. 3½. Is a sample of a brown colored soil which coffee has borne good crops for many years, and is still as good bearing coffee as ever, showing no sign of exhaustion in any way.

L. C. 3. Soil without manure. This W. O. 3½ soil has never been manured either, unless any small experiment which I may have forgot about may have been made on the spot many years ago. But the same sort of soil is equally good for the coffee all round, over a far greater extent than could have been occupied by any experiment, and including the unmanured parts that must have been left round any such. It might be useful to know if there is any peculiarity common to these two different-looking soils, that accounts for both being up to now equally good for coffee.

L. C. 4. Is a sample of soil of fair appearance in which coffee bore good crops for a good number of years, but is now very much fallen off, bearing but small crops and being unable to mature even these properly. I have, I think, some recollection of a part of this piece of inferior soil, having been manured, if not the whole of it with guano of the supply got up in 1863, or with the Australian bone-dust of 1864, but it is not mentioned in the list of experiments I made, and probably never has been manured, but so far this does not matter, as its badness is not to be attributed to any manuring or other experiment tried with it, I am sure.

L. C. 5. Sample is soil from near a patana of maana-grass. It seems good-looking soil, although there is a peculiarity about its looks. It is black with a copper-colored tinge, and although pretty deep, has a very inferior quality of sub-soil. Coffee trees grow very badly, and bear little or no crop. In the case of L. C. 4 sample, I should like to know what may be found deficient in it, as compared with samples L. C. 3 and W. O. 3½. In the case of sample L. C. 5, I should like to know, besides any deficiency of necessary materials that may be found to characterise it, if there is not some poisonous quality in it, if it be practicable to find this out.

I should like to know the proportion of organic matter in each of these six samples of soils. In all I see of artificial manuring, leads me to doubt if mineral matter be as yet wanted for our coffee, unless it may be in exceptional cases, as near native villages, in land that has in former ages been cultivated with green crops, it strikes me too from all I see of our coffee, that its falling off is mostly from exhaustion of organic matter in the soil, still this does not seem to be capable of explaining the matter in many cases.

NARANGHENA.

As requested, I now send you four samples of Naranghena soils.

W. M. L.

No. 1. From old coffee, at an elevation of 3,300 feet, bearing an average crop of from 5 cwts. to 6 cwts. per acre. This coffee is exposed to wind.

No. 2. Old coffee, same elevation as above, but not exposed to wind, bearing average crops year by year of 12 cwts. per acre.

No. 3. Coffee planted in 1862 at an elevation of 2,600 feet, and has, since it came into bearing in 1865, borne average crops of 8 cwts. per acre.

No. 4. From the forest which has just been felled, but not yet burned off.

Nos. 1 & 2. Samples have never been manured to my knowledge, which extends to 1863.

No. 3. Sample now manured with saltpetre and bone-dust in September 1860, and will this season yield a crop of 12 cwts. per acre.

SYLVAKANDE.

Samples of Soil sent by E. J. Young, Esq.

No. 1. Virgin soil from the Kandanewera jungle, adjoining Sylvakande coffee.

No. 2. Soil from good coffee, with samples of leaves, berries, &c., enclosed, done up in a bag.

No. 3. Soil taken from exhausted coffee with leaves, berries, &c.

BULLATWELLE.

The box contains nine samples, namely, No. 1. of soil, wood, and coffee berries; Nos. 2 and 3 ditto.

Sample No. 1. Taken from the face of a hill, with a westerly aspect, and at an elevation of about 1,500 feet above sea level. The coffee is very bad and stunted in appearance and, in my opinion, never can have been good. It has never been manured and, as far as I can learn, has never given good crops. It must also have suffered a good deal from rain, wash, and wind.

No. 2. Sample was taken from the brow of a hill, having a northerly aspect, and at an elevation of 1,640 feet. It has always been good coffee, and has borne good crops for many years, has never been manured, and is still vigorous coffee.

No. 3. Is taken from the best part of a young field of coffee, about seven years old. The trees have borne large crops for about 4 years past and are still vigorous, and likely to bear good crops for some years to come.

MORATENNE.

Remarks on Samples sent for Analysis.

No. 1. Sample taken from a field facing the north. The ground is steep and very stony, but shows no sign of rain-wash, the roots of the trees being well covered. The whole field is dying out, and the trees on many parts are already dead. Has never been manured.

No. 2. Sample taken from field in which the trees are good, and show no signs of decay. The land is steep and stony, and has never been manured.

COLGRAIN.

Memo. of Samples of Colgrain Soil sent for Analysis.

A 1. Taken from a field planted about 17 years ago; is very fertile; trees are very strong and vigorous, and yield heavy crops year by year without manure.

A 2. The sub-soil to the above; texture good; not too stiff, yet pretty retentive. These two soils may be taken as models of a good coffee soil and sub-soil.

B. 1. Taken from a field which has been under cultivation for 15 years or more and still crops well. The soil of good average quality.

B. 2. Sub-soil to above.

C. Very deep and very productive; the soil looks like an accumulation of soil washed down by rain.

D. Exhausted for coffee growing, and abandoned 3 years ago. It has been cultivated for 8 years, and was probably originally of good quality.

E. Exhausted and abandoned like the D sample. These two samples of abandoned soiled differ a good deal in appearance, and are from opposite hills.

F 1. Has been planted with coffee 16 to 17 years; may probably have cropped well in its time, but is now wanting in vigour.

F 2. Sub-soil to above.

G 1. Soil a good deal exhausted; has been long under cultivation.

G 2. Sub-soil to above.

H 1. Has given very fine crops, but now shows signs of falling off. Has been planted from 9 to 10 years.

H 2. Sub-soil to above.

I 1. Similar in character to the former sample, but not quite as good.

I 2. Sub-soil to above.

The fields from which the samples F G H and I have been taken are so situated on the estate, as to make it highly desirable that they should be recruited through the application of artificial manures alone, and their physical character is such as to encourage the hope that this may be found practicable.

K 1. On this field the trees are thin of wood, and do not crop well.

K 2. Sub-soil to above.

L 1. A red clay, differing much in appearance from any of the preceding samples. The trees pretty vigorous for their age.

L 2. Sub-soil to above.

M 1. Poor quartz soil, not likely to be much benefited by the application of artificial manures.

M 2. The sub-soil; this looks better than the arable which seems washed out. This soil had bone-dust and poonac applied to it, about 18 months ago, but without any result.

3 packets of the ash of a strong healthy coffee tree, grown in the soils marked A 1 and A 2.

N.B.—The depth of arable soil is very various; in some parts it is four to five inches or more, in other parts barely an inch or none at all. The above samples marked as "*the soil*" are from a depth of 2 to 4 or 5 inches, just such a depth as what are known as the "feeding roots" were found to permeate.

Those marked "sub-soil" are from a depth of between 5 and 9 to 12 inches. All the samples have been dried in the sun before being put up, and their coarser fragments picked out.

PENDLETON.

Memo of samples of soils and berries and branches of the coffee tree sent from Pendleton Estate.

W. M. L.

No. 1. Samples are selected from a field of coffee which has always borne heavily; matures its crop well, and shows no signs of want of vigour.

No. 2. Samples are taken from a field, the trees on which over-bear every alternate year; they suffer greatly; cannot mature their crop, and many of them die out year by year from the effects of over-cropping.

No. 3. Samples are taken from a field which bore heavily for two or three years, but which has done nothing since, and in which the trees seem to be thoroughly exhausted, not even able to put out leaves. The samples are all selected from coffee fields in their eleventh year, at an elevation of from 2,000 to 3,000 feet above sea level, and from fields which have never been manured.

W. M. L.

Boxes I. II. & III. contain the 3 samples of soil. Box No. IV. contains the 3 samples of fruit, and box No. V. 3 samples of branches.

GONA ADIKA.

Memo. of samples of Gona Adika soils.

W. M. L.

No. 1. Contains sample of soil from the lower and best part of Cape Colony, where the coffee is very good, and the trees bear well, but are unable to mature all the crop they bear.

No. 2. Soil from the jungle immediately adjoining the above field, and at the same adjoining on the other side, a field where the coffee is old, but has been good, and is now gradually going out.

No. 3. Soil from oldest coffee on Mount Compass, now almost extinct, and not kept under cultivation.

No. 4. Soil from the youngest coffee in "Cotipatiddy" adjoining Parawatte where the coffee is now in full bearing, and would do well were it not for the great amount of wash during the heavy rains. The soil in this field is apparently the best on the estate.

N.B.—The samples in the box are all divided, and have been put in exactly as they were originally in the field, that is, the soil at the top of the box being the surface soil, and so on, to the depth of a foot. By taking off one side of the box, the sections of soil will appear as they are in the field.

GALLOWAY KNOWE.

W. M. L.

No 1. Sample of soil from young coffee, (about 7 years old) and which has borne good crops and is still vigorous.

No. 2. Sample of soil from old coffee which has been abandoned for years.

No. 3. Sample of soil from old coffee.

FERTILIZING SUBSTANCES FOR CEYLON COFFEE LANDS.

Our best thanks are due for a copy of the report for 1870-71 of the Ceylon Planters' Association. Amongst information of a useful nature on subjects which have been already discussed to a more or less extent, we are surprised to find, for the first time published, a lengthy and most important contribution to our knowledge of the chemistry of that branch of agriculture which constitutes the main material interest of this colony. Proceedings of Committee Meetings of the Association were formerly held sacred from publication, a rule more honoured in the breach than the observance. The result of the restrictive rule, (no longer in force,) is that we only now are aware that at a Committee meeting held as long ago as 20th June 1870, "Mr. Harrinson mentioned that in accordance with the request of the Committee he had selected samples of soils, coffee, &c., from various estates and forwarded them to England for purposes of analysis. He then read a paper descriptive of the various samples sent." The analyses of soils made by Dr. Voelcker a year ago (he does not seem to have thought it necessary to report on the branches, leaves, and fruit sent to him) are published, with the opinions of that eminent agricultural chemist as to the best substances for application to such soils and the proportions of each. The soils were of all qualities, taken from estates of varying ages, and at different elevations, and Dr. Voelcker prescribes for each typical case. This contribution to the literature of coffee culture is, therefore, of general and great importance, fully justifying the space we devote to it. We intended to have drawn attention in detail to the main results established, but space to-day will not permit. For the present, therefore, we can only say that Dr. Voelcker's analyses confirm the results of previous lines as to the wonderful similarity of the coffee soils of Ceylon in all the main constituents: organic matter, oxides of iron, alumina and insoluble silicious matter.

The great problem is to ascertain the proportions of the soil of,—*first*, phosphoric acid; and *second*, potash. A few decimal parts of these essential elements efficient or in excess, make all the difference between sterility and fertility; and on the proportions ascertained, depend the quantities which should be applied to the soil of

First,—Good muriate of potash,

the imported potash of commerce, muriate, and chloride of potash meaning just the same thing,) containing 80 per cent. of pure muriate of potash. *Second*,—*Fine* bone-dust. *Third*,—*Good* superphosphate of lime, (bones treated with sulphuric acid the best form), containing 25 per cent. of soluble phosphate. *Fourth*,—*Good* sulphate of ammonia. In one case alone is nitrate of soda the form of saltpetre most allied to common (salt) recommended, and with Dr. Voelcker's verdict that it is evanescent and liable to be washed away, while, being in demand, unhappily, of the manufacture of gunpowder, it is far more expensive than muriate of potash, we may dismiss it. Four-fifths at least of what the eminent agricultural chemist considers the most efficacious manure for coffee must consist of potash, bone-dust, and ashes in the shape of superphosphate; while the phosphate of ammonia added should never exceed one-fifth. In four out of six recipes, indeed, given by Dr. Voelcker, the proportion is only 15 per cent. proportions applied, as Dr. Voelcker states, of fertilising salts he recommends, depend on the condition of the soil as revealed by analysis; but even where analysis cannot be obtained, any planter would be safe in applying a small dressing of the substances named to good soil (say 3 cwts. per acre) so as to keep it good; and a larger dressing (say 5 cwts. per acre, with about an equal quantity of poonac) to fertilise poor or restore exhausted soil. The application to secure the fullest results ought, we learn from a planter of experience, to be made annually; but once in two years would keep land fairly in heart. A most important point to be remembered is that every cwt. added to the normal produce of an estate is almost clear profit. It follows that if by adding 3 cwt. per acre annually of

manure, the yield is raised from 5 cwt. to 7, 8, 9, or 10 cwt., the immediate profit will be large, while the land will be kept permanently in good condition. The cost of 3 cwt. of Dr. Voelcker's mixture ought not, when applied, to reach £3, while 2 cwt. *additional* of coffee ought to realize £6 to £7 gross, of which according to our authority a very large proportion would be profit. Can any of our readers favour us with analysis of castor-oil cake, so that we may be able to see *why* it is so much better than cocoanut poonac which we know yields to analysis the elements of coffee? Dr. Voelcker, the man of science, attaches far less importance to organic matter than does the merely practical planter, Mr. Taylor. Organic matter is of great importance, nevertheless; just as fallen leaves, though they contain the minimum of fertilising salts, are yet most efficacious in securing the action on soil which results from warmth and moisture. In the soils examined by Dr. Voelcker the proportion of organic matter varied from a minimum of 5·07 to a maximum of 13·13; oxides of iron from 2·64 to 12·84; alumina from 6·01 to 16·47; while insoluble silicious matter proved to be never below 59·57, (alumina being in this case high in proportion,) rising to 82·23. Our soils consist of about 98 per cent. of the organic and mineral substances named, with not much more than traces in each case of such salts as sulphate and carbonate of lime, magnesia, phosphoric acid, potash and soda. In the very best soil we get ·30 of phosphoric acid, and ·27 of potash. Such soil would grow anything; but what could be expected from another soil shewing only ·02 of phosphoric acid, and ·04 of potash? This was a dark patena soil and although it *looked* well, did not, of course, grow coffee well. Even the richest manure would probably be thrown away in this case, unless the ground were first well stirred up and left for a couple of years to be aerated. The great desiderata seem to be simple tests for phosphoric acid and potash, which any Superintendent could apply. So long as a soil is found to contain appreciable quantities of each, it will grow coffee well and require but a moderate expenditure for manuring. If phosphoric acid is so low as ·10, and potash down to 15 per cent., then only heavy manuring with potash, bones, superphosphate, and ammonia, with or without poonac, pulp, &c., will enable the soil to yield good crops of coffee. So much for to-day, but we hope to extend more of the attention which it deserves to the very valuable addition to our knowledge of the successful culture of coffee contained in the opinions which Mr. Harrison, at the instance of the Planters' Association has been the means of eliciting from Dr. Voelcker. Complaints have been made, we understand, that while the association paid for the analyses, the soils analyzed were all from properties owned by one Firm. We think this was unfortunate, not so much as a matter of science, (for every possible condition seems to have been represented,) but with reference to good taste and good feeling.

VARIETIES OF MILK.

(Communicated.)

As far as we know, no nation uses the milk of any carnivorous animal. There is no reason for believing that the milk of this order of animals would either be disagreeable or unwholesome; but the ferocity and restlessness of the creatures will always present an obstacle to the experiment. The different milk of those animals with which we are acquainted agree in their chemical qualities, and is confirmed by the fact that other animals, besides man, can be nourished in infancy by the milk of every distinct species. Rats and leverets have been suckled by cats, fawns by ewes, foals by goats, and man, in all stages of his existence, has been nourished by the milk of various animals, except the carnivorous. The milk of the mare is inferior in oily matter to that of the cow, but it is said to contain more sugar, and other salts. The milk of the ewe is as rich as that of the cow in oil, but contains less sugar than that of other animals. Cheese made of ewe's milk is still made in England and Scotland, but it is gradually being disused. The milk of the ass approaches that of human milk in several of its qualities. To this resemblance it owes its use by invalids in pulmonary complaints, but it has no particular virtue to recommend its preference, and is only prescribed by nurses. Goat's milk perhaps stands next to that of the cow in its qualities; it is much used in Southern Europe. It affords excellent cheese and butter, its cream being rich and more copious than that from cows. Camel's milk is employed in China, Africa, and, in short, in all those countries where the animal flourishes. It is, however, poor in every respect, but still, being milk, is invaluable where butter is not to be procured. The milk of the sow resembles that of the cow, and is used at Canton and other parts of China. The milk of the buffaloe is also like that of the cow, though the two animals belong to different species. Every preparation of milk, and every separate ingredient of it is wholesome milk, cream, butter, cheese, fresh curds, whey, skimmed-milk, butter-milk, &c. Butter-milk and whey will undergo a spontaneous vinous fermentation, if kept long enough, and alcohol can be distilled from it. The Tartars, it is well-known, prepare quantities of spirituous drink from mare's milk.

MARKET REPORT.

HOME NEWS, 24th December 1871.

SILK.—With the exception of a few days of rather improved business a fortnight ago, the silk market has been exceedingly quiet during the past month, there having been little or no demand for the continent, and home manufacturers contenting themselves with working up their stocks. China silk has steadily maintained its former rates however, and importers continue to hold very firmly, rejecting offers of 3d. to 6d. under quotations. Thus there has been little or no sensible change in prices during the month. In Canton silk there has been occasional business at 15s. to 14s. for common to fair market Taeline, and 23s. to 25s. for finest "curio" sort, but the medium qualities have not been wanted. Leong Koogs are flat, at 21s. 6d. to 22s. for finest No. 1, and inferior qualities in proportion; but this is owing mainly to the heavy simultaneous arrivals of this silk, for which there is always so limited a demand. Japans and Bengals are both much neglected, and sales are only to be made by forcing; both these silks are comparatively very cheap, and the difficulty of getting them thrown, appears the one great obstacle to business. Deliveries last month were fairly good. Stocks are large, owing to the rapid shipments from the east since the opening of the new season, and the simultaneous large arrivals here; but the market will soon feel relief, as the bulk of the silk to arrive this season has already come forward.

TEA.—The deliveries in London estimated for the week were 1,717,949 lbs., which is an increase of 45,234 lbs. compared with the previous statement.

SUGAR.—The market continues in the same dull state as previously reported, transactions continuing very limited, and at prices in buyers' favour. 200 casks British West India sold; Demerara and Berbice, 29s. to 31s. 6d.; St. Kitts, 30s. 6d. The remainder of the parcel of Mauritius offered in public sales yesterday—1,700 at 27s to 32s.; and 600 baskets of Penang data, 24s. 6d. Refined dried goods are slow of sale at previous prices. Pieces now show a decline of 6d. per cwt. Molasses: 50 casks fine Australian sold at 18s. 6d.

COFFEE.—The small parcels offered to-day were disposed of at full rates. 130 casks, 50 bags and barrels Plantation Ceylon: fringe, 62s. 6d. small, 67s. to 69s.; low middling, 71s. 6d. to 72s.; middling, 73s. 6d. to 78s.; peaberry, 83s. to 84s.; and 70 bags Natal, 73s. 6d.; 70 packages Mocha bought last 92s. Privately, 50 tons native Ceylon sold for arrival: good ordinary, 67s.; bold, 69s.

Messrs Kilburn, Kershaw & Co.'s Circular.

CALCUTTA, 26th December 1871.

INDIGO.—In consequence of the Christmas holidays, two Public Sales only have been held during the past week; at these, 1,930 chests were offered and 1,828 chests (including some rejections previously counted as sold) disposed of, making the total quantity out of the market about 75,000 maunds. The demand has been very active, and prices, except for the very fine lots, again rather stiffer. Clean plain Oudes, and good Benares consumers are in great request, and sell at very full prices.

Exports of Indigo from 1st November to 31st instant 1871:—

	Chests.	Mds.	S.	Ch.
To Great Britain	4,615	17,549	37	0
" France	1,720	8,332	29	6
" Trieste	2,410	9,273	21	5
" Foreign Europe	476	1,642	18	7
" America	377	1,510	22	0
" Gulphs & Levante	179	693	5	15
Total....	9,777	37,191	11	15

RAW SILK.—Since our last report about 40 bales middling native rainy Jungypore have been sold at Rs. 13-8; some very low offers have been made for inferior native Commercolly, which have been refused; 20 Rupore have been offered and refused for the first 25 bales J & R. W Radnagur October bund just arrived, but in the present state of the market no higher offer is likely to be made; they will, in all probability, be shipped on owners' account: the first arrivals of native November bund are expected to be here at the beginning of next month.

The Str. *Mosam* left on the 21st instant with 38 bales for France; Str. *Petersbury* left on the same day with 9 bales for London.

TEA.—The Christmas holidays have caused business to be interrupted during the past week, and we have very little of interest to report.

A Public Sale, consisting of 863 chests, took place on the 21st instant; all were sold. There was a good amount of competition, and prices ruled firm throughout. A small invoice of Green Tea from the Chota Nagpore District realised an average of Rs. 1-2 per lb.

There have been large arrivals from all quarters during the past few days, and liberal quantities will shortly be brought forward at auction.

Reuter, under date the 20th, quotes the London market firm for good qualities.

PUBLIC SALE PRICES, 21ST DECEMBER 1871.

Equal. London price.
Chests Average Ft. 28-10; Br. 3s.
Usual Commissions.

					s.	d.
ASSAM.—Seekimbarry Tea Estate—various kinds	113	chests	15¾	per lb.	2	6¼
VARIOUS.—Sungoo River Tea Plantation, Chittagong—Pekoe, annas 15¼; Broken ditto, Re. 1; Congou, annas 11¼; Broken Mixed, annas 10¼	42	"	14	"	2	1¼
Dantmara Tea Factory, Chittagong.—Pekoe, Re. 1; Souchong, annas 10¼; Congou, annas, 9¼; Broken kinds, annas 4¼ to 11.	20	"	9¼	"	1	8¼
Kurseong and Darjeeling Tea Co., Ld.,—Pekoe, annas 15 to Re. 1-3; Pekoe Souchong, annas 12 to 14; Souchong, annas 11¼; Congou, annas 6¼; Broken Tea, annas 7 to 9¼; Dust, annas 4¼	[illegible]	"	12¼	"	1	10¼
Ramgurh Tea Co., Ld., Ramgurhbagh—Pekoe	[illegible]	"	14¼	"	[illegible]	[illegible]
Ditto.—Green Tea, various kinds	[illegible]	Rs.	1-2	"	[illegible]	[illegible]

William Moran & Co's Circular.

THE SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India.

A MONTHLY JOURNAL, DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

VOL. III.] BOMBAY, WEDNESDAY, 21st FEBRUARY 1872. [No. 7.]

Agricultural Gazette of India.

CONTENTS.

NOTICES TO CORRESPONDENTS.

Are there any Agricultural Training Institutions in this Country? I am a Hindu, a Landowner, anxious to improve my Estate, I fear that even if I could afford the expense, I am too old to be admitted as a student in the Royal Agricultural College in England. What is about the annual cost of a student at that institution?

There are not, we regret to say, any Agricultural Educational Institutions in this great Agricultural Country, a circumstance that reflects little credit, either on the people, or Government. You need have no fears as to not being admitted a student at the Royal Agricultural College on account of your age, as that is no disqualification. We remember several of our fellow-students over 60 years of age, and one or two Lieutenant-Colonels, who had served 30 years in India. You will, however, find it rather costly to go to England for [illegible] education. The College fees are 100 guineas per annum, and [illegible] extra, if you have a private room in addition to the [illegible] allowed by the College rules, and it will cost you, at the lowest, [illegible] pounds for Text Books, Chemical apparatus, and your personal expenses at College, and during the long vacations, making your expenses in England, including wages [illegible] per annum, an attendant at [illegible] at least is necessary before you can take the Diploma; [illegible] even with two or three years previous [illegible] in a Laboratory, it is more likely that you will require [illegible] years residence, before you can pass your Diploma examination. In short, you will have to expend, including expenses out [illegible] pounds, and work hard for 3 years before you can hope to get the College Diploma; but, even at this rate, if [illegible] would advise you to enter as a student at [illegible] a very discreditable state of things [illegible] Country [illegible] a Native Gentleman [illegible] to qualify himself to [illegible]

Is there any Agricultural College [illegible] Government Farm [illegible] Presidency?

[illegible]

Are there any Agricultural Societies in this Country? Are there any Agricultural Journals in this [illegible]

[illegible]

Is the Cotton of Khandesh, the Cotton of Bombay?

We believe so.

Can you recommend any other fodder crops?

Yes, Pennisetum Spicatum, Panicum Miliare, Panicum Italicum, Paddy, &c. &c.

In fact almost every one of our leguminous or cereal crops may be used for fodder, if cut before the seed begins to mature. Let us recommend to your notice, ordinary country paddy; under irrigation it may be cut even 3 or 4 times, and will yield excellent fodder, either green or dry. You must however see that it is always cut before the grain appears.

LETTERS TO THE EDITOR.

MR. LOGIN'S EXPERIMENTS.

To the Editor of the Pioneer Statesman.

SIR,—The statistical returns you have already referred to have appeared in the *Punjab Gazette* of the 1st instant. I trust it will lead to very important results towards the improvement of agriculture, and will disclose results for are prepared for. In my opinion this step will in a much shorter space of time than most people are ready to credit, effect beneficial changes of much greater moment than the most sanguine at present contemplate.

The first step in all matters, is to collect *facts*, and when trustworthy facts are obtained, practical results are sure to follow, for example the small experiment on cotton being now carried out in this neighbourhood, go to show that with reasonable care, India can, from her own indigenous seed, produce as much as the average of Egypt, or *seven times* as much as is now done by the cultivators here; but by an official return lately submitted to our Government at Home from Egypt, it is stated that with the best cultivation, as much as *twenty times* our average cotton produce in India can be obtained, and of a superior quality to that grown here.

If the above facts can be relied on, (I for one don't doubt them) what a field is there for improvement. So who can for a moment doubt that it is quite possible to double our land revenue, which would only be to bring it back to what it was 200 years ago, under Aurungzeb.

This action taken by the Punjab Government will put in motion the whole civil machinery of the province. No doubt many may wish to have their returns appear as great as possible, so at first we can scarcely expect to have them quite reliable; but it is hoped where they are found to be not so, that the parties who submit them will be "hauled over the coals" in a manner that will show to all that it is every man's interest, not only that their returns are accurate, but that his future promotion will be considerably affected by the improved out-turn.

Having thus made it the interest of our tahsildars, and all connected with land revenue to have improved agriculture, the next grand step is to convince the cultivators that it is their interest in a much greater degree than that of Government to increase their produce, which if heartily set about will be accomplished, I believe, in no great number of years. It is a firm belief in this that has induced me to urge my views, and you among others will no doubt be pleased to learn that, now that the in-gathering season is closed, my best field at Rai, 20 miles north of Delhi, which is exactly ¼ of an acre in area, produced 15 maunds, 2 seers of "kapas," and as 100 lbs. of this kapas has been found to give 31 seers of clean cotton and 69 of seed, we have 15 maunds, 2 seers = 1,204 lbs., and 1,204 by 4·3 by 0·31 = 497½ lbs. per acre of clean cotton, or just about the average of Egypt, being seven times that of India, which is said to be from 60 to 70 lbs. an acre. But I am inclined to think from my own experience that the average is rather more in this part of India—something less than 100 lbs. per acre.

Umballa, Feb. 2. T. LOGIN.

MINERAL AND SALINE MANURES.—II.

To the Editor of the Agricultural Gazette of India.

[illegible] Government Model Farms all over the country, for [illegible] agricultural classes will not have anything in fact [illegible]

look upon them with suspicion and distrust. But I would select from 2 to 4 intelligent zemindars in each Zilla or Taluck, whose holdings are situated on the lines of road leading to the civil station, and within two or three miles of it. I would supply these men with a sufficient quantity of mineral and saline manures, free of cost. The object in view should be explained and instruction given in the art of applying them to the soil. The zemindars should be allowed to select both land and seed wheat, which as well as the rate for canal water, should be paid for, and in addition I would guarantee them from all loss. Thus the zemindars, conducting the experiment, would only have to pay for the cost of ploughing (which should, as a rule, always be deep, not because *virgin soil* is to be found at a depth of ten inches, but on account of the roots of wheat and other crops not being able to descend freely into the soil in search of food, which they will do to a depth of from 12 to 18 inches, without reaching *virgin soil*, which does not exist in the subsoil, but is the *surface soil* of land reclaimed from forests and *prairie*, and has never been cropped), weeding, and other manual labour, and in order to make success an object to the zemindars, the prize of a handsome pair of silver bangles and a turban of honour, of gold and crimson silk, should be conferred on each in open Durbar, to be held after the grain was harvested, the reaping being witnessed by umpires, (zemindars of the villages), and one square chain of each field being reaped in the presence of the European official, the ears of corn being removed from the stalks, put in sacks, sealed, and carted away for future disposal. This sample of wheat should in due course be publicly threshed, the grain being weighed, after measurement, by the bushel, and the produce per acre calculated. In *England the average produce of wheat* per acre is four quarters, or 23 *maunds* 32 *seers* in Indian weight. The white wheat of South Australia, which gained the first prize in the Great Exhibition, weighed 70 lbs. to the bushel, and the wheat of Tasmania is remarkable for its superior nutritious quality; that grown on the banks of the Clyde weighed 70 lbs. to the bushel, and fifty bushels per acre are frequently obtained. On new land (virgin soil), "it is said that seventy bushels of wheat and fifteen tons of potatoes per acre is not an uncommon crop." (*Vide* Whitaker's Almanac for 1870, pages 288-289.)

Now, 70 pounds to the bushel and 70 of them to the acre, is 4,000 lbs., or 81⅓ bushels of 60 lbs. each. This converted into Indian measure, gives 80 maunds, 2 seers, 15 7/9 chittacks of wheat, and the potatoes equal 405 maunds.

If the Indian zemindar will put his shoulder to the wheel, there is nothing to prevent him from producing half this quantity of wheat and potatoes per acre.

To return to the prize-holders and their wheat, the entire crop should be purchased for use as seed wheat, and liberally paid for by the Government.

I submit, that by repeating this plan of operations for five years, selecting new zemindars for each year, and allowing the passed years prize-holders to compete for other rewards, (say a Hansi milch cow and calf, a yoke of superior oxen, a gold nine-pointed star with a *sunnud* of high approbation, bearing the seal of the Supreme Government of India), a system of intelligent, competitive wheat cultivation would be speedily established, and as the superior grain would very soon command a high value, as compared with the ordinary inferior wheat, the agriculturists would see the advantages of the transaction, and adopt the improved method of agriculture. While this plan of operations was being carried on, the Government of India should form seed wheat Farms in the districts of *Umballa, Jullundur, Umritsur*, and *Sealkote*, as also in the Hill district of Simla, and within and without the *Pinjore* valley, *i. e.*, on the *Kalka* side of *Bussee*. His Highness of *Puttiala*, and the Sirdar of *Bussee* would no doubt rent land, parallel to the Umballa road, for this purpose. The great Native Princes and Chiefs, who have to wait on His Excellency the Viceroy of Simla, should be invited to visit these seed farms, and be presented with choice wheat seed for sowing in their own territories. The prizes offered by the Government being open to their zemindars.

In these seed farms, the wheat of South Australia, Tasmania, Spain, Poland, Russia and Yarkand, should be extensively cultivated. The system of culture being that already indicated. The seed so obtained should be given to the zemindars, who are prize-holders, to sow, grow, and harvest, separate prizes being given to each successful cultivator and competitor, not being a prize-holder, whose ambition may induce him to ask for such superior wheat seed.

In the first part of this essay I have stated that five of the saline manures are under the excise. This is owing to culinary salt being present as an adulterant in saltpetre and sulphate of soda, and it was assumed that it (salt) must also be present in the others, hence all have been placed under interdict.

The value of salt, as a manure, is quite unknown to the Salt Department, in which the general impression prevails that cattle can get on very well without it, though the natives give some salt once or twice a year to their cattle, either as a treat or as a superstitious observance.

A customs or excise duty of Rs. 3¼ per maund of 82 pounds, is levied on culinary salt, no matter how produced, and as it is almost always associated in India with nitre, a similar duty is levied on the salt crystallised out of the saltpetre. Rock salt is similarly taxed.

It is stated that, for every maund of nitre manufactured, the same quantity of culinary salt has to be eliminated therefrom. Hence it follows that the nitre manufacturer is compelled to bear the expense of removing the adulterant (salt), and when he has done so, down comes the excise man for the salt duty of Rs. 3¼ per maund, or £13 10 shillings per ton.

To tax the manufacturer of nitre, for the acts of Providence, seems a curious proceeding, and when it is asserted that the measure has destroyed an Export Saltpetre Trade of some £350,000 to £400,000 per annum, it cannot be called a very wise one.

It will be shown in the course of this paper that first-class wheat cannot be produced if salt, soda, and potash are not present in the soil.

The nitrate of potash contains 46·6 per cent. of potash and the nitrate of soda, or common salt, 36·5 per cent. of soda. These substances are kept out of agricultural use by excise, and consequently indirectly will be immense, whilst a vast agricultural population will be obliged to produce inferior food (wheat) for a non-agricultural population, which as well as themselves, requires first-class food to arrest and prevent further degeneration of race.

Wheat, being the most valuable food crop cultivated by man, has only to be of superior quality to command high prices in all markets, and especially in that of London and China; therefore if India would grow more wheat, and less rubbish (officially called "*Inferior food grains*," an export wheat trade of £20,000,000 sterling per annum should be easily secured.

We know that first-class European wheat contains, in addition to water, gluten, starch, sugar, gum, albumen, and bran, a fluctuating quantity of the food phosphates.

The nourishing, or *blood flesh* and *muscle* producing powers of wheat, depends on its richness in gluten and albumen. Common wheat contains 12½ per cent., the *Triticum spelta* 22, and the *Triticum hybernum*, 24 per cent. of gluten—the two latter also contain 1½ per cent. of albumen. When we remember that rice contains only 7½ per cent. of gluten, a portion of which is always lost in boiling, a very simple calculation will show that the physical strength of the wheat-eater must far exceed that of the rice-consumer.

The value of wheat, as respiratory food, is due to its starch, sugar, and gum, and its *constructive, renovative*, and *restorative* powers to the mineral matters or food phosphates; these are derived entirely from the soil, and if they are deficient, the flesh, bone, muscle, and physical strength of the population will always show a degree of degeneration, corresponding to the deficiency.

Analysis proves that human blood, when reduced to ash, contains of,—

Phosphoric acid	21·[illegible]
Alkalies and alkaline earths	55·[illegible]
Carbonic acid	9·[illegible]

When dry human blood is burned, it leaves five per cent. of ash, and more than half of this ash (57 per cent.) is common salt, and the residue contains from 17 to 22 parts of iron in the state of oxide.—H.

CONDENSED MILK.

In 1866 an Anglo Swiss Company established themselves at Lake Zug, opposite the Rigi mountains in Switzerland, for preparing condensed milk. In September last year, a Branch Company was set up in England at Aylesbury for the same purpose, taking milk from about 1,000 cows which are pastured in this celebrated locality. The following process of preparing the milk has been taken from the *London Standard*.

Steam is got up in the factory at 6 in the morning, and the farmers who live within from 1 to 10 miles of it, begin to deliver their milk about 7; but it is nearly 9 o'clock before the last arrives. The milk is emptied at once from the large tin cans, generally used in the trade, into a trough, which conducts it through sieves into a large tank holding about 800 gallons, in the department where the first part of the process takes places. From this tank it is drawn into large open metal cylinders, which are slung up by a crane, and placed in a hot bath in large tanks, somewhat after the manner of the tins of meat in the preserving process; after remaining in this some time, they are again lifted by the cranes and emptied into large open funnel-shaped vats, whence the hot milk is drawn up through a pipe in the centre into the condensing pans on the upper floor, the sugar having been mixed with it solely for the purpose of preserving it. It remains in these, subject to somewhat low heat for two or three hours, while the evaporation of the water is taking place, and the milk gradually condensing. When this part of the process, which may be seen through the glass window of the condenser, is completed, the milk then about the consistency of liquid honey, returns by a pipe into the lower room, and is received again into the open cylinders, which are swung into the central tank; this time being filled with cold water for the purpose of cooling the regulation of the temperature during the whole process being a matter of the greatest nicety. Hence it is taken to the filling-room and run into the 1 lb. tins, which are soldered up and packed in cases of four dozen each, ready for sale. The greatest care is taken that no air enters the establishment unless perfectly air-tight; and to ensure this, each one is closely examined by a lad, who, in addition to his regular wages, gets 1d. each for every tin he finds imperfect. The purchaser has to take and pay for the contents. The condensed milk is

these tins gradually thicken, becoming slightly more consistent up to five or six months; after which it remains of the same consistency, and will continue good for years, perhaps as long as the tins themselves continue sound, and in all climates; and even when opened remains sweet for weeks.

It should be mentioned, that the greatest cleanliness is observed throughout the whole process. Even the milk-tins which the farmers deliver immediately on their being emptied, are in the receiving room placed in warm water and scrubbed inside with brushes. A strong jet of steam is turned into them, searching every chink and cranny; and finally, another very powerful jet of cold water completes the cleansing process, which is also applied continually to all cylinders and receptacles used in the factory. And in addition to this the floor of the lower room is constantly deluged with streams of water supplied by pipes from the Chiltern Hills Water Company's Works. The milk received from the farmers, at about 2d. per quart, is tested in a variety of ways several times in the week, and some is stood in pans to test the rise of cream, a record of which is carefully kept. The contracts with the farmers are very stringent, and if anything is found wrong with the milk, the Company reserve to themselves the right of returning it, and at once throwing up the contract. They are careful also to examine the police records of the district to see if any of the farmers, whose milk they take, have any cases of diseased cattle on their farms, which they are bound by Act of Parliament, under heavy penalties, to report at once to the police. The sugar used is of the best refined kind, some also from beetroot, and we need hardly observe that no adulteration takes place at any part of the process: it would be impossible, and if attempted, would at once defeat the great object, namely, the preservation of the milk: and as the article is sold only in the Company's tins, hermetically closed and labelled, it is impossible for retailers to tamper with it. The result is, that we have an article which is pure milk, not an article made from milk with the addition of sugar; all that is taken from the milk being the water, which in milk direct from the cow, constitutes as much as 80 parts out of 100. Astounding as this statement may seem, there is no doubt about it, and the stream of colourless water which runs continuously from the condensers give ocular evidence of it, and its being almost tasteless further shows that by the process the milk loses nothing but its water, and this it does to the extent of about 55 parts out of the 80, leaving in the condensed milk from 20 to 25 parts of water, the rest being the caseine, butter or fat, and other solid substances which remain intact. This is proved by the fact that when the proper quantity of water is again added to the condensed milk, it will at a certain temperature churn into butter. The analyses of the condensed milk produced by the Swiss and English Companies, made by Baron Liebig and other eminent chemists, leave no room for doubting the above facts.

In America also there are several manufactories of the condensed milk without sugar, which will keep good for a week or ten days, and it is this form which a large portion of the population of New York and large American cities have used for some years past. The English Company will probably offer some of this kind to the public, and we see no reason why it should not be very extensively used. Each household knows, with tolerable exactness, its weekly consumption of milk, and by taking a weekly supply in this form will be sure of getting a genuine article. We should not forget to mention that the English Company make a preparation of condensed milk and cocoa, which is sold retail, at about 1s. for the 1 lb. tin; the roasting, grinding, sifting, and general preparation of the cocoa is all done at the Aylesbury Works, and a most excellent combination is produced, the cocoa assisting as well as the sugar in the preservation of the milk. Two teaspoonfull, equalling in value one penny, with boiling water, make as good a cup of cocoa, already sweetened, as can be desired. They contemplate also bringing out a mixture of the milk with essence of coffee.

But to return to the condensed and sweetened milk. The present retail price of the 1 lb. tin of both Companies is about 8d., and as this will bear at the very least as much water added to it as will make it equivalent to 2 quarts of pure milk, we have a genuine article at 4d. per quart, with the addition of nearly one penny-worth of sugar to each quart, no slight consideration when estimating the price. Thus it is considerably cheaper than any milk sold in towns, even if that could be obtained pure. The condensed milk can be used for any purpose for which ordinary milk and sugar are used for puddings, custards, and other cooking purposes: less than a teaspoonfull is sufficient for a cup of tea, sweetening it at the same time; two or three times the quantity will make a large basin of sweet bread and milk.

IMPROVED AGRICULTURE IN IRELAND.

We take the following article on the improvements effected during the last thirty years on the estates of the Earl of Arran, County Mayo, from the *Irish Sportsman* and *Farmer*:—

When the present Earl of Arran succeeded his uncle in 1837, he found those estates in the most wretched condition that they could possibly be, and the occupants steeped in the most abject state of helpless misery. The late Earl, from delicate health, was an absentee for many years, and those placed in charge of the property grossly abused the trust reposed in them, and by the most unheard of miscrule, suffered the lands to be deteriorated and covered with a pauper population struggling for existence, the land being unable to feed them, much less able to pay any rent—the result of the management falling into the hands of corrupt unprincipled agents, or receivers, who let townland after townland to *squireens*, without capital or any knowledge of agriculture, who immediately on getting possession of those fine pasture-lands, sublet them to a class of tenantry, in common without capital, the middleman having no other means, living on the profit rents, and caring little about either the land or its miserable occupants, who were left to their own resources, and permitted to do just as they liked so long as they paid the rent, each or any of them being liable for the entire rent. Those tenants in common erected a cluster of wretched hovels, which they denominated villages, and divided the land in rundale, some more and some less, according to their means, so that each had a patch of good, middling, and bad land scattered here and there over the townland.

In process of time as the population increased, hovel was thrown up against hovel, and the land became still further divided, and filth, squalor, and wretchedness prevailed inside and outside the wretched dwellings. There being no fences, the cattle roamed at large after the crops were removed till the return of spring; the store cattle were sent to the mountains or bogs early in the summer, to exist as best they might; the milch-cow was kept at home, and herded on some waste patch by a child or some aged person past labour during the day. All were then in a hurry early and late in the spring, and till far-advanced in the summer to get in the crops, then came the temporary fencing between the arable and waste lands to keep off the cattle, and thus the season passed till the crops were harvested and secured, when the whole arable lands were again thrown open to cattle, sheep, pigs, asses, and poultry, in common, so that any attempt to grow clover, rye-grass, turnips, &c., was completely out of the question. In course of time, the leases, which were granted generally for thirty-one years and three lives, came to an end, and the unfortunate landlord instead of finding his property improved, or at least in the condition in which it was demised, to his horror found it exhausted, vastly reduced in value, and unable to feed the occupants, let alone paying rent for it.

When the present Earl came into possession, his horror and chagrin may be imagined, but description is impossible. Friends advised some one thing and some another. Sympathizers suggested that as those unfortunates were not his tenants, they had no claim on him, but His Lordship thought and acted differently. He admitted that the case was most unfortunate, but as he had got it and was now placed over them, he would see what could be done to humanize and lift them out of that state of misery and moral decrepitude in which he found them.

Among those, whose aid and advice would be most likely to be thoroughly practical and disinterested, was the late Mr. James Fraser, so many years celebrated as a rural architect and designer of land improvements, and whose practical experience and thorough

knowledge of the country could not but be of the utmost value in such a vastly important case, involving the improvement of many thousand acres, and the social condition and welfare of thousands of human beings. Mr. Fraser came, and after careful consultation respectable surveyors were employed, a census taken, rentals examined, and the result was the breaking up of those villages of beastly hovels, laying out good and convenient roads, a re-division of the lands, giving each tenant his portion in one lot in proportion to his rent, instead of a patch here and there; lots were cast, straight lines of fences were laid out, and each tenant compelled to build his house and offices on his own lot: the domestic animals were no longer permitted to occupy the same apartment with the man and his family, the pestiferous cesspool and the dung-heap no longer to occupy the front of the dwelling, but to be removed to a proper distance.

This new order of things caused at first great dissatisfaction amongst the people; somehow, in the redistribution of the land, everyone lost good land and noone got it, one man's house was better than another, and he did not like to part with it. Wicked words and threats ensued, but his Lordship was firm—he had taken measures for their good. A well-considered system of compensating rules was adopted, by which none could gain at the expense of his neighbour. After much vexation and opposition one townland was commenced and put in order, and soon followed by another, with the most happy results. The benefits were so apparent and approved of, that instead of opposition, the occupants of townland after townland came in and begged to have theirs "striped," as it was termed. New dwellings of a superior, but not costly, description appeared in every direction, the stable, cow-house, pig-sty, and barn followed; divisional fences were soon erected: turnips, mangold, clover, ryegrass, vetch seeds, were purchased at wholesale prices, and given at cost price to some, and to the smaller and more necessitous, gratuitously. It must not be supposed that this mighty social revolution was effected without some vexations, for the old leaven was still secretly at work; but Lord Arran had "nailed his colours to the mast, pursued his course undeviatingly, and rose superior to every device of the common enemy." He appointed two respectable agriculturists to reside on the estate—one on the southern, the other on the northern division—whose duty it was to instruct and advise the tenants in the best and most profitable systems of husbandry. The holdings are small, ranging from 3 acres upwards; the buildings are complete, except on the more recently taken up townlands, for it is only those which fall out of the grasp of the middleman that his Lordship can deal with: the houses are beautifully clean and comfortable, well lighted, and both houses and offices nicely white-washed inside and outside, the furniture clean and in good condition, the bedsteads well made, barded at top and three sides, and covered at the inside with fancy-room paper, and tastefully draped at the exposed side. All had ample stores of home-made linen, rivalling the snow in whiteness, fancy linsey, woolsey, and frieze, the produce of their own industry; so that they had almost everything they required for wear without buying, except shoes. Samples from this estate, amounting to nine different fabrics, in some cases from one family, were exhibited at the Royal Dublin Society's Exhibition in 1865, and still remain there in a glass case, as evidence of what can be done by the Irish peasantry when properly fostered and encouraged.

In consequence of the difficulty of procuring good seeds, and true to name, these people have been taught to grow their own swede, mangold, parsnip, vetch, and grass seeds, and the samples produced are for purity, maturity, and quality, fully equal to any imported. But the improvements effected in both the cottages and the land are as nothing compared with the social regeneration and independent spirit of the people. When Lord Arran first came amongst them, it was disgusting to his mind to see them follow him in crowds, fall prostrate before him, grovel in the mire, kiss his boots, his hands, and garments; he has now, by his treating them as human beings, infused so much of his own independent spirit amongst his people that he can walk through his estates without any man wasting his time to follow or do anything more than respectfully saluting him.

In former times, when misrule reigned, those extensive estates were governed by absentee and local agents, with a dozen of drivers or bailiffs at their heels, who fleeced the tenants unsparingly. The district pounds were seldom unoccupied at any time throughout the year by the defaulting tenants' live-stock. All these cormorants have long since been sent to the right-about, and a respectable high-principled resident agent appointed to second his principals' views. There are no bailiffs or drivers on the estate; there is no longer any use for pounds. Formerly the tenants were from two to five years' rent in arrear; now the rents are regularly paid up, and little or no arrears, and many with money in the bank; and we have no doubt similar results would follow the same humanizing treatment of the poor ignorant tenants on other estates. But it will be asked, what has all this improved state of things cost? In reply we say, with the exception of his own personal exertions, the cost of surveys, the stipends of the agriculturists, and some assistance in road-making and draining, these stupendous improvements, and the quietness and content they have conferred, have cost his Lordship nothing.

The designs and erections are his and his *employés*, but they have been worked out by the well-directed labour of the tenants themselves, whose willing minds and sinewy limbs succumbed to no toil, being assured that what they effected was exclusively for their own sole use and benefit. Such have been the benefits conferred by the Earl of Arran amongst his numerous tenantry, by his going in earnest and perseveringly to work; and after attentively watching its progress for so many years, we have no doubt but that, with similar means, the same results would follow in any other part of Ireland.

Note.—And we would add, in India; the conditions herein described are just what we meet with in every part of this country. We commend this article strongly to the consideration of our Government, its Agricultural Department, and our Landowners.—*Ed. A. G. of I.*

EDITORIAL NOTES.

As there seems to be some misunderstanding as to the conditions of the trial that is to be made at Saharunpore in April, of the competitive machinery sent in for the treatment of rheea fibre, we are requested to publish the following letter from the Government of India upon the subject for general information:—

Department of Agriculture, Revenue, and Commerce,—No. 170.

Calcutta, the 27th December 1871.

To Dr. R. H. Collyer,
199, Brompton Road, London, S. W.

Sir,—I am directed to acknowledge the receipt of your two letters of the 25th October, on the subject of your process for the treatment of the rheea fibre.

Apparently you have misunderstood the intentions of the Government of India with reference to the conditions of the public trials to be held at Saharunpore in April next. The Government of India never intended to debar intending competitors from applying any process they preferred to the treatment of the stem in any condition of the latter, green or dried. Green stems only were certainly referred to in the notification of the 20th January last, because it appeared from the experience that had been acquired that the fibre could be treated successfully only while fresh. Hence the announcement that green stems will be furnished to intending competitors. It will be open, however, to you and any other competitor who may prefer it, to dry the green stems which will be furnished, and to operate on them in the dried condition.—I have the honor, &c.,

J. GEOGHEGAN,
Offg. Secretary to the Government of India.

In an article on the Poultry yard in the last number of the *Agricultural Gazette* we mentioned the frequent and sudden deaths that occur among poultry in the cold season. The *South of India Observer*, last month, gave the following testimony on the subject:—

We would caution all owners of poultry to be careful, as disease is rife, and many persons have lost all their fowls, some people as many as fifty or sixty. We hear that segregation has saved some. The epidemic is very

violent; fowls perfectly well one day are dead the next. All kinds of remedies have been tried, such as garlic, calomel, but with little benefit. Whitewashing fowl-houses, separating the fowls, and keeping them at distances from each other are the best remedies. Ducks and even geese have fallen victims, to say nothing of the Christmas turkey.

A correspondent in the *Gardener's Chronicle* thus writes of the successful results of artificial incubation:—

I have just received by Cape mail a copy of *The Farm*, published in Grahamstown, containing an article on the successful results of an incubator I constructed for the purpose of hatching ostriches, and as the report may prove interesting to your readers, I beg to forward an extract. I believe this is the first instance on record of ostriches being hatched artificially. The Editor says:—"At the Jubilee Exhibition an improved incubator was shown by A. Douglas, Esq., Hilton, near Grahamstown, and we hear from Mr. Douglas that after a few alterations and the exercise of a little patience, he has got the machine into capital working order, and finds it answer admirably, having hatched a troop of ostriches with it, which—with we suppose the help of the artificial mothers—have grown up all good-sized chicks. We would merely add, for the information of anyone who may wish to know about this operation, that the eggs are kept up to a temperature of about 100 to 105 by the aid of an oil lamp, at the cost of a little over a penny for the 24 hours. We think this mode of rearing young ostriches, when it comes to be understood, will be pretty generally adopted."

Dr. Auguste Vinson, in the *Sugar-Cane*, is amused at the simplicity of those who are constantly enquiring after the seed of the sugar-cane. He refers such to the common grass of our day, the *sorghum*, which he believes to be the original of the cane. The faculty of reproduction is so entirely lost in the modern cane, that were it not for human skill it would disappear altogether. He declares the title of *saccharum officinarum* to be a mere conventional designation, and adds:—

"The sugar-cane has no botanical existence. It is not in nature. "It is men who have made this plant; and therefore, being of "artificial production, manured, denaturalized so far that it cannot "reproduce its own forms, it is to be regarded as one of the great-"est conquests of man over nature, one of the grandest marvels "which industrial and agricultural power have yet achieved.

"To search for sugar-cane, with a view of regenerating, is to "march in a direction diametrically opposite to that in which we "have been going, and it will prove a delusion. Seed can only be "procured by a prolonged degeneration, and no single observer "could live long enough to obtain the result. It is planting, con-"tinued through previous and successive generations, which has "produced the cane by deformation and cultivation; it is a human "and artificial production. To seek for cane seed therefore is to "follow after a myth—an impossibility."

We learn however from the *Sugar-Cane* that at one of the sittings of the Chamber of Agriculture of Mauritius, one M. Lemarle, of the island of Reunion, informed the Chamber that he had been so fortunate on his estate as to establish the possibility of the reproduction of the sugar-cane from seed.

We read in the *Bombay Gazette* that "a number of proprietors and superintendents of coffee estates, both European and Native, resident in North-West Wynaad, recently addressed Government on the neglected state of the district, which is suffering from want of roads, and especially from want of cart-road communication with the Coast and with other parts of Wynaad."

The *Cochin Argus* tells us that "the prospects of those who trade in coffee were hardly at any former period so good as they are now." Placing these two readings one after the other, the *Bombay Catholic Examiner* remarks that there is a "strong cause for reproach against the British Government, for a neglect which so flagrantly checks the prosperity of the country it has undertaken to rule. Good cart-roads were, in the opinion of the writer, "the want that demanded the attention of Government in preference to every other want for the physical improvement of the country." "In fact," the writer goes on to say, "the experience of the managers of our great lines of Railway has been precisely to this effect, and the working of the immense line, for instance, from Bombay to Jubbulpore, has been and is still many times more expensive, on account of its being in parts so inaccessible from the cultivated parts of the country. A good, plain means of transit by land and by water was the first requisite in the work of turning the riches of India to account. Speed in transit, in the writer's idea, was a sort of luxury, which might be pleasant enough to the upper classes, but it could not be called a requisite, as far as millions of people and acres in the country were considered. Whereas, it is most certain, he ends by saying, "that had the millions of money swallowed up by our railways been first allotted to the work of making good roads, communicating with the ports along the coasts and with the rivers, the country at this moment would have both roads and railways, and be at the same time much richer than it is."

A fresh series of analyses of the ashes of tobacco has been prepared by Mr. Broughton of Ootacamund, in continuation of those published sometime ago. It appears that Mr. Broughton has now examined nearly a hundred samples of tobacco grown in the Presidency of Madras. These analyses prove conclusively that tobacco is a great consumer of potash, and that the ashes of a tobacco are invariably poor in this mineral, when it has been grown in a soil deficient therein. But these are facts which have long been known to the agricultural chemist, and to the most intelligent cultivators of tobacco in Europe and America. The work performed by Mr. Broughton was therefore quite out of proportion to the value of the results obtained. Still these analyses possess a local value. They partially explain why the tobaccos of Southern India are so inferior, and why one district produces better tobacco than another. Still we are yet only on the verge of the inquiry. Mr. Broughton's investigation extended only to the percentage of potash and nicotine contained in the tobacco examined. We should like to be informed regarding the lime, phosphoric acid, magnesia, and soda which together, form thirty-five per cent. of the ash of the best varieties of American tobacco. Most of the American tobaccos give an ash containing at least twenty per cent. of lime. May it not be possible that the inferiority of the tobaccos of Southern India is due to a deficiency of lime as well as potash? Again, many of these American tobaccos contain as much as nine or ten per cent. of phosphoric acid, which we know is present in very small quantities, even in the best of our arable soils. Again, we should like to know whether lime, magnesia, and soda, and potash will replace each other, as they are known to do in many plants cultivated by the English farmer, as it will make a great difference in the profit of growing tobacco, if soda, costing £10 per ton, can replace potash at £20 per ton. It would, we think, have been much better had Mr. Broughton made a *complete* analyses of the ashes of some half-dozen well selected samples grown under known conditions, and of the soils upon which they were grown. However what we require still more are analyses of the juice of the tobacco plant in different stages of maturity, to assist us in determining the nature and proportions of the organic acids and salts. We need also special researches into the chemical changes effected by the fermentation of tobacco. The fact that remarkable changes do take place is well known, but they are not sufficiently understood to enable us to control them.—*Indian Statesman.*

Mr. Willoughby Wood advocates the claims of pedigree in the *Farmer*:—

"It is nearly twenty years since I began to advocate in your columns the claims of pedigree to the attention of practical farmers. At that time pure breeds of domestic animals were in the hands of comparatively few men. With some of these the cultivation of blood was a profitable monopoly, while with others it was a speculation, in which only the wealthy could indulge with impunity. The ordinary farmer, whose cattle were reared for feeding or for dairy purposes, regarded animals with pedigrees as "fancy stock," with which he had as little concern with as a prize tulip or carnation. In the exceptional case of one who gave a liberal price for a well-bred bull, the neighbours shook their heads, and hoped such extravagance might not be his ruin. But the rapid advance which about that time took place in the price of stock, caused attention to be turned to rearing animals of an improved character. The demand for the better qualities raised their price so greatly in proportion to that of inferior kinds, as to render the breeding of the former an object well-worthy of the study of agriculturists. I pointed out that the best means of

effecting the improvement of stock at a reasonable cost, was by the purchase of pure-bred short-horn bulls, to be used with the ordinary cows of the district. The effect of the offspring is so decisive that the steers or heifers of such a cross may be taken as worth some £5 a-head more than if they had been by a mongrel bull. Some of the finest animals ever exhibited have been the result of a cross between a short-horn bull with a cow either of another pure breed, or of an ordinary dairy cow. Thus any farmer owning a herd of cows, possesses the means of improving his stock almost indefinitely, by the purchase of short-horn bulls. Gradually men have become convinced that this small outlay yields a return of profit which is not exceeded by any other agricultural investment. Thus a demand for pure-bred bulls has been steadily growing on the part of men who breed for practical purposes, and who, not expecting to sell their stock for fancy prices, look for their profits to the butcher or the dairyman. Such purchasers have no preference for one strain of blood over another. All that they require of a bull is that he should be the sire of heavy thriving steers, and of large good-looking heifers. They are careless of show-yard honours, excepting those of Islington, Birmingham, or wherever else quantity and quality of beef are held to be the sole criterion of merit. There can be no doubt that such a demand as this is the only solid foundation on which a pure breed can rest. Is it a fact that the offspring of pure short-horn bulls attain heavier weights at an earlier age than the offspring of ordinary bulls? Then the demand for the former must continue and extend. If on the other hand, it should ever be found that the introduction of pure blood, so far from insuring size and early maturity, was the means of introducing light flesh, weak constitutions, and dwindling frames, then the days of short-horns would be numbered. They would pass away and be forgotten, as has been the case with breeds once as fashionable, but which ultimately failed to satisfy the practical requirements of the time."

Hearth and Home, an American paper, contains the following remarks on the pursuit of farming as a recreation. They are entitled "Can an educated man get a living by farming":—

"An educated man cannot make a living by mere manual labour either on a farm, in the blacksmith shop, or in the factory. He may do more work in an hour or in a day, and do it better than the uneducated man by his side. A man with brains, other things being equal, can pitch more hay, or dig more rods of ditch in a day than the mere man of muscle. But what of it? The uneducated man can perhaps earn 1½ dollar per day, and the educated man, from his superior skill, can do one-third more work and earn 2 dollars per day. But will extra 50 cents a day pay him for his years of hard study and self-denial? Will 2 dollars a day go as far in providing the luxuries and necessaries of life for himself and his family, as the 1½ dollar will in the other case? Will it enable him to educate his family as well as he himself has been educated?

"An educated man, to get a living by farming, must do work that an ignorant man cannot perform. On an ordinary sized farm, and with ordinary farm men, he will find no lack of employment—or if he does, he must change his system of farming, and go into some of the higher branches of agriculture or horticulture. No matter how thoroughly educated he may be, work he must, and work hard too—self-denying work, "honest work," as Carlyle says, "which you intend getting done," and then go at something else.

"This is the secret of success in all undertakings. There are a good many educated men who, having made money in other pursuits, turn their attention to farming. We wish there were more such. We extend to them a right hearty welcome. But as a general rule, they will not make farming pay. It is not the business of their lives. It is not work: it is recreation, and they should expect to pay for it, as they would for any other amusement. We know a lawyer—one of the ablest in the State—who has retired on to a farm. He makes a capital good farmer: has the neatest and cleanest farm in the neighbourhood. He also takes real delight in spreading manure, feeding his stock, and digging and laying under-drains. He works harder than any other man on the farm. But it is not work to him anymore than rowing is work to the Howard Club. Some time since a wealthy New York merchant wished to consult him on a legal question of great importance. He went to the house and was told that the "Judge" was out on the farm, going to look for him, he found an old man digging out an under-drain that had got stopped up. He inquired for the Judge, and was told that he would be there in a few minutes. He concluded to wait. The man kept on throwing out the mud. "Dirty work," remarked the kid-gloved merchant, as he stood on the side of the ditch in his patent leather boots. "How much does the Judge pay you a-day?" "I have taken it by the job," was the reply, "and shall not make my board." It was the Judge himself, and he undoubtedly told the truth. Hard he works, and skilful a ditcher as he certainly is, he nevertheless cannot make his board in digging under-drains. This noble old veteran of the Bar and the Bench spent the next day in writing an opinion that was worth more money to the merchant than it would cost to drain the Judge's whole farm. This was work and would command its price; digging ditches was play to the old Judge, and was paid accordingly—paid in restored health and in command of vigour of mind and body. But it would not pay his board.

"The educated farmer must do precisely as other successful men do. He must not spend his time in doing things that he likes to do. He must exercise self-denial; with him farming is business, not pleasure. Because he likes to chop, it will not do to leave the care of the stock to Patrick, while he goes to the woods and "puts up" his two cords and then spend the evening with his neighbours, boasting how much work he has done that day. In fact, he has not worked at all. Had he stayed at home and attended to his stock, and done other things which he did not like to do, but which were necessary to be done, and which Patrick could not do, then he would have worked, and would sooner or later have got his reward.

"Amateur farmers, notoriously, do not make a living. And yet many of them are thoroughly educated men, and not a few know far more of the theory and practice of agriculture than their successful neighbours. Their failure is usually attributed to their employing too many men, and in not "getting the work out of them." There is some truth in this: but we have known an eminent successful contractor on a railroad, who owed his success to his energy and to his ability to manage men, utterly fail in making farming pay. And in his case, at least, the cause was not in his ignorance of general agriculture, or in his employing too many men, or in his inability to get the work out of them, it was due principally to his neglecting the little details of farming. He was inclined to do things on a large scale, and he made the mistake of going into the raising of those crops which require minute attention, and this he neglected to bestow. He would have done better had he confined himself to some one or two leading crops, such as wheat, corn, or potatoes, but he thought the profits not large enough."

NOTES FROM CONTEMPORARIES.

A Dr. Getty has discovered a remedy for the blight, the foe of the gardener and fruit grower. It is simply the application of a decoction of quassia with a brush to the parts of the tree or plant affected by the blight.—*Delhi Gazette.*

Sad accounts reach us respecting the state of the wheat crops throughout the province, although the reports of District Officers are as yet silent thereon. It would seem that the late and unseasonable rains have had the effect of bringing in their wake that destructive insect, the *gerwa*, and the corn stands a great chance of deterioration in consequence. We trust matters may not be actually as bad as Agriculturists represent however.—*Lucknow Times.*

We learn that one of the simplest means of keeping flies from annoying horses or cattle, is to take a bunch of smart weed (*Polygonum hydropiper*), bruise it so as to cause the juice to exude, and rub the animal thoroughly with it, especially upon his neck, legs, and ears. Neither flies nor other insects will trouble him for at least twenty-four hours. If preferred, an infusion may be made by steeping the weed and applying the liquid with a sponge.—*Delhi Gazette.*

THE cultivation of flax in New Zealand is attracting much attention at present. A pair of shoes made of woven fibre of New Zealand flax were lately shown in a shop window at Nelson, made thirty-five years ago, as well as other specimens of the fabric woven by natives, and as a contrast, two samples of coloured cloth for shirtings lately manufactured in England. The latter cloth is said to be silky in appearance, and both soft and flexible, and an attempt is to be shortly made to manufacture sheeting from flax. —*Pioneer.*

IT is said that the petroleum wells of Burmah promise after all to become a success. Even at the depths at which the shafts are at present sunk, the yield covers the working expenses; but the native workmen accustomed to these operations declare that no true spring has yet been struck, and that the oil at present obtained is only that which has trickled in from cracks of the rocks through which the boring passed. When "ile" is really "struck," they say that it swells up with a simmering sound; and that it will be struck if the shaft is only carried on to thrice the present depth they do not doubt.—*Indian Statesman.*

THE novelty of the season in the horticultural world at Bangalore is the Amaranthus Salicifolius, an annual introduced from the Philippine Islands. It is of pyramidal form, from two to three feet high, branching close to the ground. The branches extend in a horizontal position, the leaves are beautifully undulated, and assume a bright orange red. Full grown specimens bear a very close resemblance in habit of growth to the well-known Croton Angustifolium. It is confidently believed that this unique Amaranthus will prove well-suited to the climate.—*Times of India.*

IN the cold season, plants and cutting in pots suffer from extremes of temperature, the pots being made of porous clay regularly watered, become when exposed to sun and wind so many water-coolers or refrigerators to the roots inside, especially those round the sides. This will explain why at this season so many plants do better in the ground, for there they get a certain amount of bottom heat, instead of losing it by evaporation. To insure delicate plants keeping healthy in pots through the cold weather, they should be plunged, as gardeners term it, that is buried to the brim in earth ashes or fermented dung according to the degree of heat required to the particular class of plant.—*Bangalore Spectator.*

THE Cotton Commissioner of the Presidency reports that the breadth of land under cotton this season is very materially contracted. Including the Native States under the administration of Bombay, the total reduction of the area is estimated by Major Moore at about 600,000 acres. The exact figures are:—

	Acres.
Decrease in the Northern Division	278,132
" the Southern "	203,037
" the Native States	225,652
Total	766,821

Neither the Sind returns have yet been received, nor some others, and Major Moore estimates that the net decrease will prove to be about 617,000 acres. As the average out-turn of clean staple in Western India is 60 to 70 lbs. per acre, the falling-off represents about 100,000 bales, a quantity too trifling to have any effect either upon the local or Liverpool market.—*Indian Statesman.*

AT the last meeting of the Agri-Horticultural Society, Calcutta, a member introduced some Ribstone-pippin apples in capital preservation, to the notice of the Society, with the following remarks:—"These apples were picked by me from a tree in my garden in Devonshire in the middle of September last. When picked they were tolerably ripe. I had them carefully rolled in tissue paper, and with some soft clothing put in the bag in which I now show them. They were sent Overland via Southampton, and arrived in India on the 22nd October. As you will see, they are still in excellent preservation, though they have already been two months in this country. Judging by my success with these apples, I have no doubt, with ordinary care, many fine kinds might be brought to India."—*Bombay Gazette.*

ANY suggestions, remarks the *Englishman*, for the reclamation of the "Usar" (usar) soils, or soils containing an excess of salt, which prevail extensively in different parts of the North-West Provinces, are most valuable. One of a very simple character, which has successfully stood the test of practice, is furnished by the Commissioner of Sind, whose memorandum on the subject is printed in the supplement to the last *Gazette of India*. When the salt is in moderate quantity, a crop is sown in spite of it, and the stalks of whatever is produced are cut off and left on the ground, into which they are afterwards ploughed to decompose. Where the land is subject to inundation, the next rise produces a film of good soil, which is also ploughed in. Another crop is then sown, which gives a superior yield; and repetition of the process described leads to further continual improvement. The same plan has been tried where fresh water was used for irrigation, and given good results; and there appears to be no reason why it should not be generally adopted. The possibility of remunerative success depends of course on the proportion of saline matter present in the soil.—*Indian Statesman.*

THE question whether the sugar-cane ever matures its seed in India, was raised we observe at a late meeting of the Agri-Horticultural Society in Calcutta. The enquiry was first addressed to the editor of this journal some months ago, by the American Consul at Bombay, at the instance of the Agricultural Department at Washington. We ascertained that no attempt was made to propagate from seed in Southern India, and Mr. Blechynden now tells us that "so long ago as in 1844, the Royal Agricultural Society of Jamaica made a similar enquiry, and that some interesting correspondence was the result, shewing that so far as had been ascertained, the cane was not known to be anywhere propagated by seed." In 1843, the subject was again mooted on the occasion of a small quantity of seed being presented by Mr. W. Haworth, which he had obtained from some fields of cane in the neighbourhood of Kandy in Ceylon. This seed was carefully sown in the Society's garden, but failed to germinate. The rattoon crops of foreign varieties of cane, more especially the China, had frequently been found to grow in the Society's garden, but the seed had never proved fertile. The result of all enquiries would seem to show that sugar-cane cannot be raised by seed.

The *Sugar-cane* magazine states distinctly that the cane is simply a common grass, which has been improved by the continued care of man for thousands of years into the modern cane, and that it has absolutely lost all power of reproducing itself by seed. In a late number of the same journal however, we see it stated that at a recent sitting of the Chamber of Agriculture of Mauritius, a letter was read from M. Lemarle, of the island of Reunion, informing the Chamber that "he had been so fortunate on his estate at *Riviere-des-creoles*, as to establish the possibility of the reproduction of the sugar-cane from seed." This communication was the cause of a very long discussion, the result of which we are not told. —*Indian Statesman.*

(*Indian Statesman.*)

THE Secretary of State for India has just forwarded to the Madras Government the following Report by Doctor Forbes Watson on a sample of Yea Valley cotton which had been forwarded to England by that Government for professional valuation. The cotton was grown on the Madras Experimental Farm:—

"This cotton was submitted to, and valued at from 10d. to 10½d per pound by the Cotton Brokers' Association in Liverpool on the 28th ultimo. It was likewise valued by a firm of brokers in the same place, and at the same time, at from 10d. to 11d. per pound. It is considered to be similar to Peruvian cotton, and the prices named are nearly identical with those quoted for the best qualities ("good and fine") of Peruvian cotton at the same date, and it ranks higher than "good" Egyptian, as will be seen from the subjoined table which gives the means of comparing the value of the Yea Valley sample from Madras, with that of similar staples in the Liverpool market, during the week ending 28th September last."

Description of Cotton	Classification and Value per Pound.					
	Ordinary.	Middling.	Fair.	Good Ordy.	Good.	Fine.
	d.	d.	d.	d.	d.	d.
Cotton from the Yea Valley seed grown in Madras in 1871, value 10d. to 11d. per pound.	8½	9	9½	9¾	10½	10½
Peruvian	7½	8½	9½	9	9	11½
Persian	7½	8½	9½	9½	10½	13
Egyptian						

"It should be mentioned that during the same period American 'Middling Uplands' was selling at 9a. 6d, and American 'Middling Fair Uplands' at 10½d. per pound, whilst the price of the two best sorts ('good') of Indian cotton in the market at that time, namely, 'Hingunghaut' and 'Middling ginned Broach,' amounted to 8½d. and 8¾d. respectively.

17th October 1871. J. FORBES WATSON.

AGRICULTURE IN EUROPE.

THE IMPROVEMENT OF LAND.

The President of the Highland and Agricultural Society of Scotland recently brought under the attention of the Directors of the Society the importance of "the improvement of the cultivation of land so as to increase the produce of human as well as of animal food." This subject, the Marquis of Tweedale said, "he had for many years thought was of greater importance to the public than the improvement of the breeds of cattle, sheep, pigs, &c., which had, in his opinion, reached the climax of perfection." If the improvement of the cultivation of land, brought under public notice by the President of the Highland Society, is considered from a national point of view, it is impossible to adequately appreciate its importance should that improvement cause such an increase in the produce of the soil of the United Kingdom, as to render the inhabitants comparatively independent of foreign and colonial supplies of those products which go to the sustentation of men and the domestic animals. Some of the highest authorities on agricultural topics have said that there would be no difficulty in so increasing the produce of the soil as to meet the consumptive requirements of the country; but to ensure this increase, thorough draining, deeper and more perfect cultivation of the soil, with improved systems of cropping, are requisite. There exist ample opportunities for the application of capital and skill for improving the cultivation of land. The extent of arable land, the cultivation of which could be advantageously improved, and the extent of unreclaimed land capable of being profitably reclaimed, are both points which call for investigation on the part of the committee appointed by the Directors to consider the question raised by the President. The amount of capital which would be required to effect these changes in reclaimed and unreclaimed lands could be easily obtained, provided proper security were given. This want of security is the greatest hindrance to improvement in cultivation, especially on the part of the tenant-occupiers. Comparatively few landowners at the present day undertake the carrying out of those improvements of the soil essential to ensure its profitable cultivation, draining excepted. A different state of matters as regards landowners making improvements existed even as late as the middle of the last century. It is now about three hundred years since Lord Bacon wrote:—"The improvement of the ground is the most natural way of obtaining riches, for it is our great mother's blessing, the earth's, but it is slow. And yet when men of great wealth do stoop to husbandry it multiplieth riches exceedingly." What was true in Lord Bacon's time is not less true in our day in the present state of agriculture in England and Scotland.

Confining the consideration of the question however to the improvement of the cultivation of land in Scotland, as the subject has been brought under the attention of farmers by the Marquis of Tweedale, there are collateral questions which have an intimate connection with the subject, such as the hindrances to the progress of improvement in the cultivation of land. The most prominent of these is, insufficient security to the occupying tenants; and the first question with them is, will the improvements pay those who undertake them? This will depend in a great measure upon the amount of capital requisite to effect the improvements, and the time which must necessarily elapse before the increased returns from the land repay the capital with the interest of that capital. The President of the Society stated—"I believe from experience that the land of second and third quality is capable of very great improvement, and at a much less expense than farmers imagine, were they possessed of the means applied by the most experienced in carrying out successfully the contemplated improvements." Presumably the experience of the Marquis of Tweedale has been gained in effecting the improvement of about 1,500 acres of land near the village of Gifford, East-Lothian, and which is still farmed by the Marquis. The improvement of part of this land was commenced about thirty years ago, and the whole operations connected with these improvements have since been skilfully conducted, and the land well farmed. The improvements are most favourable examples of what can be effected by the command of ample capital judiciously applied, with the time requisite to reap the pecuniary benefits from such improvements as thorough drainage, deep and perfect stirring of the land, the improvement of the texture of the soil by the application of lime composts, and of vegetable matter taken from the bottom of a drained lake, and the application of a limited amount of auxiliary manures furnishing nitrogen and phosphoric acid to the soil—the farm-yard manure produced on the farms being the chief manurial agent employed to raise and maintain fertility. The lands were originally poor clays or retentive loams. By means of the improvements effected, lands which were previously worth not more than about 10s. per acre to rent on a lease of nineteen years, are now worth from 30s. to 35s. per acre, and perhaps more than one of the farms would at present let at 40s. per acre.

The lands previous to their improvement were not inviting to tenant-farmers holding under leases of nineteen years, and at the rents at which they were formerly let, did not prove profitable to the occupying tenants.

The improvements, viewed from a landowner's point of view, were a great success, for there can be no doubt but that the capital expended, and the skill and labour applied, were judicious outlays on lands naturally inferior, but capable of being very materially improved. The improvements, considered from a tenant-farmer's point of view, however, holding under a nineteen years' lease, and without conditions in the lease as to payment at its termination for unexhausted improvements, assume a somewhat different aspect. The improvements might have been judicious on the part of a tenant, provided they were executed during the beginning of the lease, and the seasons were favourable for clay-lands situated at altitudes from 500 to 800 feet, or more above sea level. The expenditure of the necessary amount of capital to effect similar improvements to those so successfully carried out on the farms situated near the village of Gifford would not be under twenty pounds per acre, the interest of which sum and its redemption, say in fifteen years, could only be met by a large increase in the amount of produce. In the possession of the landowner, capital expended in raising the real value is amply met when the increase in the hiring value of the land covers the interest.

In the case of those holding land by ordinary lease, the facts referred to by Lord Bacon should not be lost sight of in making improvements—namely, that "great wealth" requires to be expended on the ground—the return from which, as he remarked, "is slow."

The practical example shown by the Marquis of Tweedale as an improver of land of second and third quality, and his example as a farmer producing full crops without an extravagant expenditure upon the purchase of auxiliary manures, have not been generally understood by many of the tenant-farmers in East-Lothian—although his example as an improver of such lands cannot be, as a rule, generally followed by farmers holding under leases for a period of nineteen years, with the ordinary conditions of the way-going tenant in the country of Haddington.

The improvement of the cultivation of land depends however on something more than rendering the soil thoroughly dry by means of drains, and friable to certain depths by the use of subsoil ploughs, with the alteration of its texture by the application of lime and vegetable composts. Manures are indispensible for the improvement of almost all lands. The farm-yard manure made and applied on the Yester farms is obtained from feeding a large number of cattle (250) during the winter and spring months on turnips, the cattle receiving in addition a certain quantity of oleaginous cakes. About 1,500 sheep are kept on the farms, a number of these being high-bred Leicesters. To keep and fatten cattle with a profit, comfortable housing for them is indispensible. The erection of suitable additions to the farm offices however cannot be regarded as an improvement to be undertaken by a farmer farming under a lease with the ordinary clauses as to way-going; and where suitable buildings are required as an adjunct to the improvement and cultivation of the land, the necessary buildings should be erected by the landowner.—*North British Agriculturist.*

AGRICULTURAL STOCK—INDIA.

THE CATTLE PLAGUE.

(*Indian Statesman.*)

Sir,—Your remarks on the cattle plague in this country has led us to forward you the enclosed article on chloralum. Professor Gangee, who discovered this useful and unique disinfectant, was consulted by the Privy Council on the rinderpest visiting the United Kingdom some years ago, and we believe it was owing to his advice that measures were adopted which succeeded in ridding the country speedily of the dreadful scourge. Whilst fearlessly resorting to the poleaxe for the diseased cattle, the healthy were protected by disinfectants, amongst which chloralum now takes the first place.—We are, Sir, yours faithfully,

23rd January 1872. R. T. SOUTHERN & Co.

ON CHLORALUM.

The ever-increasing attention paid to sanitary matters, and an intimate acquaintance with the nature and spread of contagion, invest with a special interest the study of disinfectants. We may hope some day to reduce to a minimum the demand for agents which are to neutralize the effects of filthy accumulations, such as under wise sanitary rules should never be witnessed; but we are still far from the period when perfect drainage and the complete utilization of sewage may protect us from offensive effluvia that are constantly inducing sickness, and an unnecessarily high rate of mortality amongst human beings. In fact, instead of the employment of disinfectants being on the wane, it is largely on the increase, and the practice of disinfection would, by this time, have been more generally pursued, but for the noxious and offensive character of the few agents which are known to check decay, and destroy contagion with any degree of certainty.

Tar and its products have from time immemorial been credited with active antiseptic and purifying properties, but the odour which pervaded the

[illegible] of the first to the cleansing of stall posts and the sense of smells in hospitals, [illegible] hitherto unpleasantly obtrusive to be so popularly in demand. The discoveries in chemistry which have led to the manufacture of very pure and very cheap coal distillates, such as carbolic acid, have enabled surgeons and hospital officers to extend very widely the employment of what I may be permitted to term the antiseptic. We are not however by any means exclusive; the first, that just in proportion as carbolic acid, the [illegible] principle, have we had an increase in cases of accidental or suicidal poisoning by it; and its application on an efficient scale to the refuse of towns is quite incompatible with the essential utilisation of such refuse for agricultural purposes.

There is but one agent that, so far as we know, can supersede carbolic acid. It is the chloride of aluminium, which was introduced last year by Mr. John Gamgee, and which, in the entirely new form of a hydrated chloride, is fine enough to be fit and deodorise sewage, to fix and destroy organic poisons, which must otherwise pollute the air and engender disease. This hydrated chloride, now very widely known under the name of chloralum, is in no way injurious animal or plant life. Mr. Francis Vigers, a surveyor of extensive experience, was the first to use it systematically, in deodorising, day by day, a large quantity of sewage, which was pumped over land. One gallon of solution, containing 30 per cent. of the chloride, effectually deodorised 100 gallons of sewage, and completely arrested the evolution of foetid gases and other noxious effluvia such as are known at times to produce dysentery.

And here it may be well to dwell for a moment, on the power of chloralum as a deodorizer. Its action is peculiar and to a certain extent unexplained. Dr. Stevenson and others have asserted that, on adding chloralum to a sulphide, the evolution of sulphuretted hydrogen with the well-known fetor which characterises this compound proved that it was not an active deodorizer. But it is certain that sulphuretted hydrogen is not, as a rule, the cause of foul smells, which are by some attributed to ammonia, and especially foetid organic ammonias, which are neutralized most effectually by the hydrochloric acid of chloralum. Moreover the aluminic chloride from its action as an antiseptic, completely prevents decay and the formation of the foetid gases of decomposition.

I have tried many experiments with chloralum, and found it completely successful in preventing the bad odour of urinals, in purifying the air of stables, and rendering drains and sewers as wholesome and odourless as it is possible ever to obtain them.

There are certain well-odorous things which, if washed, are unattacked by any deodorizer that I am acquainted with, with the exception of hydrochloric acid, or the chloride of aluminium. The discharges from the anal glands of carnivorous and feline animals, the well-known odour of toomcats, or a dog kennel, and, as Professor Houghton, of Dublin, has shown, the penetrating fetor of the secretions of foxes, polecats, and allied creatures, are completely removed by the use of chloralum.

But it is not only as a deodorizer that chloralum is gaining ground. In a fever ward it is the most manageable of all agents for the complete destruction of fever germs. Small-pox patients experience the greatest relief from its use as a gargle or as a wash to the skin. In scarlatina and diphtheria it has a similar grateful effect; and by suspending cloths dipped in it in a sick room, the attraction of moisture in virtue of the deliquescent character of the chloride favours evaporation from the fevered patient's surface, and produces a cooling sensation that is quite grateful even to by-standers.

The chloride in these cases acts as a contagion destroyer, probably in virtue of its acid rather than its base, and Professor Wanklyn has told me that he considers the use of this solution as the most admirable method of washing with strong hydrochloric acid, which is rendered quite harmless in consequence of the aluminous base with which it is combined.

It is not only in destroying contagion that chloralum is found of service. Surgeons are using it extensively in the treatment of wounds and ulcers, and as a detergent and deodoriser, in cancer it has been found of great service by several surgeons.

Not being a medical man, I shall not dilate on the many applications that have been suggested for this new antiseptic. As a sanitarian, however, a year's experience and very close examination of the subject has convinced me that an agent has at last been discovered which is quite unobjectionable as a household disinfectant, the medical professors can recommend, as they have done very extensively of late, without running any risk of accidents, or, what is even worse, neglect in attacking poisons, the existence of which cannot be traced beyond the sick room. The discharges of all fever patients should be neutralised as fast as they form, and the clothes and bedding should be dipped in chloralum, and then steeped in pure water, so as effectually to prevent the spread of disease during the transportation of linen to disinfecting chambers, or from the admixture of garments in the laundry.

TOBACCO.

TOBACCO CULTIVATION.

We have much pleasure in publishing some further correspondence on the analyses of different tobaccos grown in the Madras Presidency.

Mr. Broughton, referring to certain samples of tobacco sent for analysis, writes to the Secretary of the Madras Horticultural Society as follows:—

I have the honour to report on the specimens of tobacco, sent to me a short time since.

They were of five foreign kinds, and consisted of fine large leaves, especially the Manila and Havannah. These leaves with [illegible] possess all the mechanical qualities for making good cigars. The [illegible] of the specimens were unequally and badly fermented, and had the appearance of having been [illegible], being [illegible] and [illegible], as if not intended for making cheroots.

[illegible] I append the results of their analyses. A full [illegible] of the analysis of the separate leaves will be found in a [illegible] report, Proceedings Madras Government, Revenue Department, 27th July 1871, No. 861, with which these results may be usefully contrasted:—

No.	Description of Tobacco.	Per cent. of Ash.	Per cent. of Carbonate of Potash.	Per cent. of Nicotine.
75	Manila tobacco	24·31	·71	2·80
76	Havannah do. (rubbish manured)	20·07	·65	4·12
77	Havannah do. (horse manured)	24·21	·60	2·45
78	Virginian do.	22·43	·74	3·56
79	Maryland do.	23·06	·78	2·60

The above table shows, that with the exception of No. 76, Havannah tobacco (where the amount of nicotine is too large) the strength of the tobaccos is nearly the same as that produced in their respective countries. But the quality of the whole of the tobaccos is entirely spoilt by the composition of their ash, which contains not more than three-quarters of a per cent. of potassic carbonate, instead of 9 or 10 per cent. This is a peculiarity quite fatal to the quality of all tobaccos for the smoking of Europeans.

I cannot but consider that the examination of these tobaccos is of great interest to the subject of tobacco cultivation. It appears to me to shew that the soil of the place on which it grew, and consequently probably that of the Madras districts, is unfit for the cultivation of tobacco. Whether this could be remedied by the application of potassic manures, such as wood ashes or nitre, I am of course unable to say, though such an experiment ought certainly to be tried. It seems however to be nearly clear that the Madras district will always be under greater difficulties than some other parts of the Presidency in producing good tobacco for European smokers. The ordinary deficiency of the ash of Indian tobaccos in potassic salts is most certainly the main defect they possess, and is undoubtedly a principal cause of their indifferent character in the European market. I desire to point this out emphatically.

I have had cheroots made of the specimens of each kind, and have smoked them. They were, with the exception of No. 77, utterly without flavour, and all useless for smoking. This deficiency is however to be attributed, in great part, to the want of proper fermentation, the tobacco being frequently almost uncured.

I have the honor to request that you will be good enough to communicate this short report to the Board of Revenue, it being a continuation of their Nos. 2278 and 3704, dated respectively July 27th and August 28th 1871.

Again, in a letter to the Secretary to the Board of Revenue, he says:—At the end of September I received a letter from Mr. McQuhae, Acting Collector of Madura, which informed me that he forwarded specimens of tobacco from the Dindigul and Pulni talooks of the district, and shortly after I received a case containing many samples of tobacco. As these tobaccos have a certain reputation in South India, I submitted them to analysis. The tobaccos are of three kinds, respectively, named in the districts of Pulni Vattacappal, Oosicappal, and Yerumaicappal. The method of cultivation and curing, of which accounts were forwarded, do not essentially differ from those followed in other parts of the Presidency. Subjoined is a tabular statement of the results obtained, which are given in the same form as in my first report, with which the present one is intended to be continuous:—

No.	Tobacco specimens from	Per cent. of Ash.	Per cent. of Carbonate of Potash in Ash.	Per cent. of Nicotine.
80	Dindigul, Neiamatte	21·90	9·45	2·77
81	Do. Tattapatti (Ramasamy)	29·16	3·45	2·27
82	Do. do. (Vellacoundar Pillay)	23·26	10·00	2·27
83	Do. Cumgyveddy (Chinnamah Gowdan)	21·49	4·27	2·24
84	Do. do. (Tirumalay Gowdan)	20·21	10·77	1·21
85	Do. do. (Rapoo Gowdan)	22·04	21·64	1·77
86	Do. do. (Coopoo Reddy)	20·21	10·04	2·43
87	Do. do. (Ramasamy)	22·43	3·49	1·68
88	Pulni Yerumaicappal	21·41	2·11	3·10
89	Do. Hampatti Vattacappal	21·13	12·19	2·08
90	Do. Avayampatti do	25·93	2·22	1·35
91	Do. Cumbipatti do	21·52	5·24	2·42
92	Do. Ramachandrammagatty Oosicappal	18·46	5·2	3·41
93	Do. Pomgara Oosicappal	22·26	7·11	1·90
94	Do. Sherrypatty do	22·97	4·88	1·60

It appears from the above that much tobacco of Dindigul thus examined possess certain qualities that are absolutely necessary for tobacco of good quality. Examined on the principles which I enunciated in the report above mentioned (Government Order, July 27th, 1871, Revenue Department, No. 1213), it will be observed that Nos. 82, 84, 85, 86, and 93, possess the amounts of potassic salt and nicotine, which are found in good tobacco. By actual smoking, I found the first three of these, or those obtained from Dindigul, to be not of bad quality; the two latter, though sound tobaccos, had an unpleasant flavour, undoubtedly due to careless curing. These two latter were from the Pulni block. The whole

of the tobaccos were inferior to certain specimens which I received from the Godavery Lankas, and all had the flavour of Indian tobacco. I may mention furthermore that I have met with cheroots sold by Messrs. Campbell & Co., Dindigul, which in flavour were superior to the best of the tobaccos I have received from Dindigul.

This clearly shows the importance of care in manipulation and curing, from the defect of which all native-grown tobaccos suffer more or less. The considerable variations in the amount of potash salts in tobaccos grown in the same village show most markedly the influence of cultivation on the quality. Had the finer foreign tobaccos been cultivated as Nos. 82 and 84, there is no doubt whatever that the result would have been successful. What is now wanted for the introduction of good tobacco cultivation in this country is for the finer kinds to be grown in any of the localities where the amount of potash in the ash of the present tobaccos is found to be in the necessary proportion. Suitable experiments with manures will hereafter doubtless extend the sites, but at first the general defect of Indian tobaccos should limit the trials to those places where this most essential quality is of natural occurrence. I do not think the analyses of carelessly prepared native tobaccos is likely to be of much further service, now that the general conditions of the field are known. Analyses of carefully grown and prepared tobaccos should take their place.

SUGAR.

One Mr. Raoul has announced to the Academy of Sciences that cane-sugar can be converted into grape-sugar by prolonged exposure to light. It took 5 months to convert 10 grammes of white-sugar into grape-sugar or glucose as it is called. This is of no practical importance, as we can get as much grape-sugar as we want from rice, and when that fails we can obtain it from old rags.—*Bangalore Spectator, January* 21st.

THE SUGAR INDUSTRY.

The Russian Government greatly desire to promote the introduction of the sugar industry on the Caucasus. The manufacture of sugar in the south of Russia, as is well known, has assumed features of undoubted importance; and we are informed that any person who may establish sugar manufactories in the Caucasus, will be most encouragingly treated by the Government, enjoying for two years a total exemption from all duties, and afterwards being subjected to very lenient imposts.—*Darjeeling News.*

THE COMMON PLANTAIN.

Sir,—Your editorial note on the propagation of the sugar-cane suggests to me an enquiry on that of the common plantain. This tree has long been propagated by transplanting the numerous offshoots which sprout out all round the root, that the seed, if sown, will not now germinate. A wild plantain of small size is very common on the cliffs and edges of the ravines along the Western Ghats. I should be thankful for an account from any of your readers of this wild plantain, and of any connection between it and the cultivated one.—*The Indian Statesman.* B. A.

GRAPE SUGAR.

Glucose, grape-sugar, or the sugar of fruits, is a sugar which differs from ordinary cane-sugar in containing a larger quantity of water. Ordinary cane-sugar is a compound of carbon and water in nearly equal proportions, but in grape-sugar the water is in excess. The sugar contained in grapes, in honey, and in the majority of sweet fruits, is glucose. It is easily extracted from candied raisins or from honey by washing with cold spirits of wine to remove the uncrystallisable syrup, then dissolving the glucose by warm water, clarifying and evaporating the syrup thus obtained. Pure glucose is white, much harder than cane-sugar, and less sweetening. It is the only sugar that is capable of fermentation, that is to say, conversion into alcohol. Cane-sugar, starch, and lignine must pass into grape-sugar before they can be fermented; and this change may be easily accomplished. An impure glucose is much used by brewers to increase the sweetness of wort, and consequently the strength of the resulting beer. A purer quality is much employed, especially on the Continent, in making up medicated lozenges, where sweetness is not so much a desideratum as hardness. On the Continent, as also in some parts of England, immense quantities of alcohol (spirits of wine) are manufactured from grape-sugar. In order to do this, advantage is taken of the fact that oil of vitriol has the power of changing starch, woody fibre, linen rags, or any other ligneous matter into grape-sugar. The following is an outline of the process followed:—The starch, paper, woody fibre, potato slices, or rags, &c., are mixed with half their weight of dilute oil of vitriol. When the mixture has stood twenty-four hours, it is diluted in a large quantity of water and boiled for four hours. The oil of vitriol is then removed by means of chalk, with which it forms an insoluble precipitate. The liquor is now filtered through animal charcoal, which removes any colouring matter. This liquor is now a solution of grape-sugar, and may be fermented in the ordinary manner, after which it is distilled in order to separate the spirits of wine.—*The British Trade Journal.*

A MARTINIQUE SUGAR MILL.

We extract the following interesting notes on a Martinique sugar mill from the *Trinidad Chronicle*:—"At the Petit Bourg Usine the canes are ground in a mill of 40-horse power made by Cail and Co., of Paris. The rollers are much thicker in proportion to their length than the general run of mills manufactured in England and Scotland. Although of 40-horse power, the mill at the Petit Bourg Usine has rollers only 5 ft. in length. This mill extracts about 72 per cent. from plant canes, and from 69 to 70 per cent. from ratoons. The steam is applied both for the machinery and boiling by five multitubular boilers of the shape of locomotive boilers. Were coal only used, these boilers would be equal to 100-horse power each, but as the megass is consumed in the boiler furnaces immediately on its issuing from the mill by the aid of two tons of coal per diem for each boiler, their efficiency as generators of steam is diminished about one-half; that is to say, the five boilers barely supply 200-horse power. The amount of sugar manufactured is about fifteen tons per day of fifteen hours; and the waste of animal charcoal about fifteen tons per annum. Sixteen centrifugals are used, driven by two 12-horse engines. This Usine, which is not on a large scale, is fed by means of about six miles of railway; the rails weigh about 25 lbs. to the yard; the gauge is about 4 ft. Sixty cane waggons are employed, measuring 11 by 8 by 2½ feet, each capable of carrying about 6,600 lbs. of canes, and each drawn by one mule, of which there are twenty-five attached to the Usine, all small animals. The average cost of the tramway per mile, in an undulating country similar to the Naparimas, is about 7,000 dols. per mile; on level land the expense hardly exceeds 5,000 dols. per mile. There are three lines of rail laid down before the mill to facilitate the discharge of the waggons. The cane waggons on the tramroad are loaded by the cane growers, but they have nothing to do with the expense of traction on the tramway, or the cost of laying it down, and repairing it. From the mill the megass is carried by a web to a platform about 16 ft. above the ground; this platform is about 40 ft. square, close boarded to a height of about 6 ft., except where the web discharges the megass at the end of the platform opposite the discharging web, on five shoots leading direct to the furnace mouths of boilers, at an angle of about 50 deg. The megass is shoved into the furnace by the stoker, with sufficient coal to enable it to burn freely. The boilers contain from 120 to 130 tubes, 3 in. diameter inside, and about 18 ft. long. The grate surface is about 4½ ft. by 6 ft., the chimney is 70 ft. high, by 3 ft. in diameter, and of sheet iron. Each boiler has a separate chimney. The sides of the boilers are not coated with any non-conductor, as it has been found that the damage caused to the boiler by the contact of any insulator, and any leakage that may take place is not compensated for by the heat saved, which would otherwise be lost by radiation."—*The British Trade Journal.*

SUGAR-CANE SEED.

(The Sugar-Cane.)

Through the courtesy of Mr. Wm. Drumm, we have received a few seeds of the sugar-cane raised by him from the purple variety. We are taking steps to ascertain whether plants can be raised from them in this country under suitable conditions of temperature, &c. We hope Mr. Drumm will be successful in raising new and improved varieties of cane. The subject is one of great importance: we are glad that it is receiving attention.

The following letter is from *The Barbadoes Reporter*, of April 25th:—

(To the Editor of the Barbadoes Agricultural Reporter.)

Dear Sir,—We learn from *The Sugar-Cane*, for April, something further as to sugar-cane seed, showing us that the suggestions of Mr. W. Drumm as to the reproduction, crossing, and improving of the sugar-cane by growing it from its seed have been followed up with good promise of success in New Caledonia, and also established in the island of Reunion, p. 202 and 205. Here, in Barbadoes, as it is chiefly the transparent or purple cane which produces seed, we do not care much for that variety, being fully satisfied that its seeds are preferable and better as natural grown plants, and perfect seed have been obtained at our general canefields. We would advise all who desire to procure suggestions [illegible] to follow Mr. Drumm's advice, and cover the arrow of the cane with a fine muslin bag [illegible] and tight on the stem till the whole is fully ripe, and then to pick out the few perfect seeds from the multitude with a mag-

ripening stem of good power. The sugar-cane seed shown for the last five years at our exhibitions, and now to be seen at No. 1 Bazaar, cannot be sown distinctly with the best of good grass, but with a magnifying glass they show themselves perfect seeds, very much like miniature oats. We are advised that we may have some more seed plants to show at our next exhibition, and we have as good a right to hope and expect success with the sugar-cane, as the Strangers of America had when they crossed the wild fox grape seeds of their prairies with the cultivated kinds, and procured the prolific wine and luscious table grapes of that Continent. It is a fact that we want new and better varieties of the sugar-cane.

DRUMM & Co.

THE SUGAR-CANE SEED.

(By Dr. Auguste Vinson.)

I am always surprised at one thing, and that is how people should have made and eaten so much sugar without knowing the origin of the cane which produces it. It appears to me a matter of importance, if not of duty, for planters and manufacturers of sugar to inquire into the history of the plant which leads them on either to fortune or to ruin. To me this has been an absorbing study, and I believe that by the observation of phenomena connected with it, I have arrived at the truth. At present my conclusions appear to answer all the necessities and probabilities of the question.

The name of *saccharum officinarum* given to the cane is not a botanical designation, but purely conventional. The sugar-cane is nothing less than a conquest of humanity—a plant produced by artificial rearing—in short, an agricultural production which is entirely human. Being a thing which man has developed by depriving it of its means of reproduction, it would, if left to itself, inevitably perish; it continues to exist simply by cuttings planted by man, who is interested in its preservation: it is an ideal production, the result of the training of many centuries. To be convinced of this, it is only necessary to look into history. Sugar descends to us from the most ancient of the industrious peoples of Asia, particularly the Chinese, the oldest nation of workers on the earth. It is from China that the cane has spread into the islands from whence we have obtained it, and where we find the most beautiful, the richest, and more perfect species.

I am amused at the *naiveté* of those who are seeking for cane seed, and for the simple reason that, since it has required the lapse of centuries and the unremitting labour of successive generations, in order to train the cane so far from its original type, at least an equal period of time will be necessary to bring it back to this, together with such constant effort as mankind is incapable of without a direct interest, which shall be powerful and even instinctive. It would be necessary to undo that which has been accomplished—gradually to descend the same ladder by which the present elevation has so slowly been reached. It would be well if people could be convinced of this truth, namely, that far from obtaining cane seeds in order to regenerate the species, it will be necessary for the cane to degenerate to obtain the seed. Moreover, to bring this about would be a work of centuries; and even if it should be accomplished, what would be the result? Doubtless a common grass already known to botanists. Now I believe that this grass is the sorghum.

The pompous title of *saccharum officinarum* falls to the ground. The sugar-cane has no botanical existence—it is my firm conviction that it is not in nature. It is men who have made this plant, as I before stated; and therefore, being of artificial production, manured, denaturalised so far that it cannot reproduce its own forms, it is to be regarded as one of the greatest conquests of man over nature, one of the grandest marvels which industrial and agricultural power have yet achieved. The object was a necessity, in order to induce generations to work like bees for the production of this human honey which is called sugar.

Now, all the facts derived from observation and investigation, from practical cultivation, and from the study of dispersed and various species resulting from one common origin, serve to corroborate the truth of this my theory. In the place of the primitive and original reed—that meagre grass, with long knots and thick bark, with leaves slender, narrow, speckled, and absorbed into an enormous pyramidal tuft, which weighs down the whole plant under the weight of its monstrous seeds, we have a thick and well-nourished stalk, with shortened and inflated internodes, a delicate rind, containing a sap rich in sugar, well-nourished, and succulent, with fresh and graceful leaves, without seed plumes, or with simply a small muslin tuft.

Now let us consider how this applies to the species of cane which is the object of our study, and the parent of sugar industry. All our observations go to corroborate my theory concerning the origin of the sugar-cane. We distinguish between those canes which sprout and those which flower, and the latter we find have longer knots and harder rind. Wherefore? I think because they are less removed from the natural type. Again in canes which do not flower, we find the internodes shorter and thicker, and the rind less hard; the reason being, as I believe, that they are more removed from the original type. The former are more rapid than the latter, and the latter, like those races of animals which are most domesticated, are most liable to disease, and thus they have been more damaged by the epidemics to which this remarkable grass is subject, insomuch that the planters, to their great chagrin, have often been obliged to abandon the cultivation of the most perfect species of cane, and to confine themselves to those which are less rich.

I spoke of the races of domestic animals; these, like the sugar-cane, have all been produced by artificial means. It requires all the knowledge we possess to recognise the humble animal known as the wild horse, with his white coat, furry and curled, with his misshapen and vicious head and frightful hoofs, as the ancestor—remote it is true—of the high-bred English or elegant Barbary, or the intelligent horse of the Arab. It would require a strong effort of the imagination to suppose the exquisite barzette, or the pointer, descended from the snarlish wolf-dog of nature. Our beautiful cane proceeds in the same way from the vulgar sorghum. This is my opinion. We must then drop the name of *saccharum officinarum*, if we would be found botanists. But animals do not, like vegetables, lose the faculty of reproduction. This is distinctive of animals, yet they also become less prolific or sterile when their form is improved by cross-breeding. It is likewise in this manner no doubt that all our fine roses, so rich in colour, so full of petals, of such great size, and of such various appearances, and so odoriferous, have descended from the simple briar. But Buffon has said long ago, with regard to the canary so much associated with man, that it was a human product, an artificial bird, and as such non-existent in nature. Has not wheat been a creation of the same kind, only that the art has been applied in an opposite direction; in the cane the seed disappeared to the advantage of the stalk, but in wheat the stalk has vanished for the development of the seed. Here is the hypertrophy of the seed, since art has provided for the indefinite reproduction of wheat by means of it—admirable design wonderfully executed. Therefore to seek for cane seed is to follow after a myth—an impossibility. The sugar-cane, as we are acquainted with it, cannot seed. The seed exists in a grass so remote from the sugar-cane of our day, that it has no resemblance to it, and should be differently designated. To search for sugar-cane seed, with a view of regenerating by this means, is to march in a direction diametrically opposite to that in which we have been going, and it will prove a delusion. Seed can only be procured by a prolonged degeneration, and no single observer could live long enough to obtain the result. It is planting, continued through previous and successive generations, which has produced the cane by deformation and cultivation; it is a human and artificial production.

At its highest point of perfection the sugar-cane does not flower. The cane that has not attained to this high state of cultivation, and which is nearer to the original, does flower. The mixed cane, which is an intermediate state, flowers upon a poor soil, but not when placed under privileged conditions. The sugar-cane presents numerous varieties, or species descended all from one unique type, which I believe to be the sorghum. These varieties or species have been gradually produced by geographic and climatic influences. Plants which have been artificially produced, cannot be other than artificially classified. In adopting efflorescence, as a criterion for purposes of classification, doubtless good observers have been in the right. But it is necessary that the resemblances should be complete, and not only partial. In this way three groups may be formed:—

1st.—Canes which flower.
2nd.—Mixed canes which flower on arid soil, and not on rich soil.
3rd.—Canes which never flower.

Since the internodes are long on the flowering cane, moderately long on the mixed sort, and short and thick in the cane which never flowers, the classification will be in accordance with the true criteria—namely, the greater or less perfection at which the plant has arrived.—*The Sugar-Cane.*

ORANGE TREES.

A warm, well-drained, friable soil is essential, not only to the well-being, but almost to the bare existence of orange trees, as they will not even live long among soil of a cold adhesive nature. In the N. W. Provinces it is by no means rare to see young trees suddenly exhibiting all the symptoms of decided bad health after having flourished almost luxuriantly for three or four years. Their leaves become yellow, fall to the ground, and the points of the leading branches die back. The cause of all this, I think, will usually be found in the fact that the roots have got beyond the artificial soil among which they were planted, and have entered the natural soil, among which they either cannot find nourishment for the branches, or the degree of heat which is essential to their active existence. In either case it is very plain that the natural soil must be removed, and substituted by mould of a more genial and porous nature; but should the natural soil be cold as well as poor, and so have chilled the roots, the points of them ought to be pruned away, and as a matter of course the branches should be pruned back at the same time, and so give the roots a fair chance of establishing

themselves among the new soil. I, some years ago, saw a few trees of a considerable size planted among soil of a strong, but by no means of a very retentive nature; and as soon as their roots got beyond the artificial soil which was placed about them when they were planted, they began to retrograde, and now they are fit for nothing save the flames. In the case of the trees in question I am convinced that ill-health was induced and confirmed by the coldness, and not by the poverty of the soil, as on the same soil peaches, limes, and mangoes grow luxuriantly. Neither in its natural nor artificial state can the roots of the orange tree be either frequently or long subjected to a temperature beneath 50° with impunity; and no soil, however good, can atone for the lack of the essential degree of heat. In the Azores, where, according to Mr. Wallace, the soil is composed of friable loam and volcanic matter, underlaid with a mass of shattered rock and rubble, a single tree has been known to produce in one season as many as 20,000 oranges. The mean temperature during winter in the Azores has been ascertained to be nearly 58°, during spring 61°, during summer 68°, and during autumn 62°; and so the difference between the temperature of winter and that of summer is only ten degrees; whereas the disparity between our winter and summer temperature is something greater than three times this. There is however but little difference between the temperature of our cold season and that of winter in the Azores; moreover, as the trees mature and ripen their fruit during November and December, the great difference of our summer temperature may have next to no influence on the trees either for good or ill. At any rate I feel almost confident that where orange trees thrive badly in the N. W. P., the soil, and not the climate, is at fault; and although we have next to no power over the latter, we can make the former almost what we please; and I think that every one who is anxious to produce good oranges should endeavour as far as possible, to imitate the soil of the Azores. From the facts above given, it is clear that drainage is of the utmost importance, and for this purpose I know of nothing better than brick rubble. To insure proper drainage the whole boarder intended for orange trees should be excavated to a depth of three feet. This done, put in about a foot of brick rubble and a slight blending of very roughly-ground bricks. If good, the surface soil of the boarder should be well-cleaned and mixed with tree leaf-mould and bazar manure, so decomposed as to have the appearance of dark, very rich earth. In mixing, put in two parts of this manure, to one of leaf-mould and one of earth, and if well done, this ought to produce a loam which will neither accept nor retain an injurious amount of moisture and in which the roots will find a genial temperature as well as a bounteous supply of nourishment. By some this may be considered a somewhat laborious method of planting orange trees, but apart altogether from the proverbial saying that "whatever is worth doing at all is worth doing well," I feel sure that this will ultimately prove the most economical as well as the most satisfactory method. Orange trees do not like the knife, in fact they cannot be pruned into anything like a symmetrical form. They *will* spread out long, lanky stems; shoot up and become pendulous, and in this perverse tendency may be seen the reason why even comparatively young orange trees are so frequently in a broken-down condition. The weight of the fruit and the strain of the weather almost invariably prove overmuch for them. Therefore, instead of cutting the branches away, their points should be tied down, and by so doing, the sap in its upward flow will in a manner be constrained to put the buds in motion where the strain on the branches takes effect. Thus, instead of wasting the substance of the plants in producing long, lanky, and anything but useful stems, it is utilized in maturing the bent-down branches, and in producing young ones, to be also bent-down in their turns. Orange trees respond to this treatment in a wonderful manner. At present I have some young plants on the bent-down branches, of which there are as many as ten and twelve young shoots. I do not think that anyone needs to be told that a symmetrical tree cannot be framed without plenty of young wood; and I know of no other mode of training, save this, that will cause orange trees to throw out young wood wherever in the formation of the trees it may be required. Their situation should if possible be high and exposed; water should be given most freely when the plants are forcing and maturing their fruit.—*Planter.*

THE COCOANUT.

(*Ceylon Observer.*)

Apropos de rien:—It is singular that in the various accounts that have been published of the cocoanut-palm, no mention is made (at least I do not recollect meeting with any) of the *edible* cocoanut, named by the Singhalese, *narai*. This fruit in all respects like the ordinary cocoanut, differs from the latter in this particular, that the tender husk (within the outer rind) is sweet and palatable, and can be eaten or chewed according to fancy to very nearly half-way down the nut; only the bottom part of the shell being too tough to be masticated. Children are very fond of the *narai*, and they will go on munching it with great gusto, until their lips and tongue become brown with its juice. The water, or rather the *milk* as some people call it, of this nut, is insipid, being slightly saltish to the taste, unlike that of the ordinary young cocoanut, which is generally sweet and refreshing. The tree-rat is very destructive to *narai* trees; seldom allowing the fruit to become ripe, they gnaw the tender one wholesale and drop them on the ground. The King-cocoanut is par excellence worthy of its name; the golden clusters of this fruit on a healthy tree is a most beautiful sight not to be equalled even by the fabled apples of the Hesperides. Again there is another kind called the *Rang tembili*, from the brilliant red crown you find on it on removing the stalk. I have read of the fruitful cocoanut-trees growing on the banks of the Maha Oyat, (the same account that reached the hands of a gentleman settled in India who afterwards wrote to Colombo for plants of the wonderful trees), but I can without vanity show you here, trees bearing more than thirty nuts in one bunch, the result it must be confessed, however, of the care bestowed upon them for a quarter of a century. As a pendant to this, I may relate the tale of a cocoanut-tree somewhere near Matara, which I believe to be true. This tree bore plenty of fruit, but strange to say they were *never* plucked, until one morning the villagers discovered that someone had stripped the tree during the preceding night. While gossipping according to wont, an old man remarked that he was astonished at the hardihood of the thief, because the tree was infested by snakes. The *thief* who was present, on hearing this, started up in mortal alarm, cried out that he had been bitten by snakes, and eventually sickened and died, but not before confessing that he had robbed the tree in ignorance, and that he *had* been stung by what he thought at the time to be wasps. The poison did not take effect until after he had heard the fatal doom, and then the body succumbed to the awful truth realised by the mind! Talking (or rather writting) of trees reminds me of an extraordinary opinion current among the Singhalese. In several instances I have noticed that where cinnamon-trees were rooted out for building purposes in Maradana, the *cashew-apple* trees left for shade, gradually drooped and died. I asked several men the reason of this, and they all replied, the cinnamon tree supplied the cashew with nourishment, and that when it was removed, the latter pined away and died! Now these men were from different villages, but accustomed to field-work at Colombo, and all gave the same opinion at different times! That the cashew-tree flourishes luxuriantly in the midst of cinnamon is a fact that can be witnessed any day, but why should it not do so otherwise? I have seen the cashew growing among other trees, but not when the ground was laid bare for habitations. How unlike the friendly cocoanut-tree that loves the sound of the human voice and thrives best on the oxygen breathed by man! Then why this difference? Perhaps the barren soil of the cinnamon gardens has something to do with it, but I should like to have the opinion of your botanical correspondent on this point. Those stately trees in the Borella cemetery, now deprived of their companions, are fated to wither and die, but some who chose their last resting-places under their shade, are now beyond the reach of human hopes and wishes. Whence this mysterious affinity? Do "the loves of the plants" exist in reality, or are the poetical Germans wrong when they endow the vegetable world with passions like ourselves?

NEMO.

RICE CULTIVATION.

Result of the experimental cultivation of Carolina rice in the Madras Presidency.

The Board are called on to forward, for transmission to the Government of India, a report on the experimental cultivation of Carolina rice in the Madras Presidency, and a summary of the various reports received from Collectors and others who have undertaken the cultivation of the American rice since 1866, is herewith submitted. Supplies of the seed have been forwarded from time to time to all the Collectors, and the experiments have been made both with freshly-imported seed and also with acclimatized seed obtained from previous crops grown from the seed imported from America. In the following outline of the reports received by the Board, each district will be considered separately.

Malabar.—From Malabar reports were sent in June 1866, March and May 1867, and in May 1868. The first trial appears to have been a failure, which was attributed to the seed having been sown too late in the year, which however could scarcely have been the cause, as autumn has been shown to be a favourable season for sowing. The report dated March 1867 is very much more favourable. In one of the most successful trials made the seed was sown in June and reaped rather more than four months afterwards. The seed was steeped in water for five days before it was sown, and the ground was prepared by ploughing five times and manuring with cowdung, leaves, and ashes. The crop was transplanted before reaping. Almost all the characteristics of the Carolina paddy given in the "Resolution" of the Government of India on the subject were recognized in this case. The report

[illegible] in May 1868, dated from Tellicherry, was on the whole [illegible]. All methods of sowing were tried, and the cultivator arrived at one, that it by most in accordance with the natural habit of the plant to sow it broadcast, but that the out-turn from a transplanted crop would probably be greater. It was found that the seed should not be sown too thickly as the shoots thrown out are very much more numerous than in the case of indigenous rice, and require more space. The best alluvial soil appeared to be most suitable for the cultivation of this plant, and, except under exceptional circumstances, the land should be artificially irrigated. The results of nineteen experiments were given, and in every case which did not entirely fail, the out-turn was far greater than that from indigenous paddy sown at the same time, the largest yield reported being one hundred and sixtyfold. The natives were said to be much struck with the superior qualities of the rice and straw, and to be anxious to cultivate it. The experiments reported on in May 1868, appear to have failed from over-irrigation.

North Arcot.—The first report received from North Arcot in March 1866 was unfavourable, the seed supplied having been at fault; but in March 1867, a very full report was received, which showed that the cultivation of Carolina paddy had been most successful. The Collector, the Sub-Collector, and Head Assistant, each conducted experiments, and all with a certain amount of success. The natives appear in each of these experiments to have been unanimous in praise of the qualities of the rice; they seemed, however, to think the straw too coarse for fodder. The method of cultivation adopted appear to have been similar to that employed in the cultivation of ordinary Indian paddy, the land being frequently ploughed, copiously flooded, and manured with leaves, cattle litter, &c. The seed after being steeped in water for three days, was sown broadcast, being then in an incipient state of germination, and the ground was not again irrigated for five days, after which time until a few days before reaping, it was constantly irrigated. A further report from this district in April 1871, shows that the cultivation of the American rice has been continued with success. In one case six measures of seed produced 240 measures of grain and eight bundles of straw, and in another the produce of nine measures of seed was 345 measures of rice and 14 large bundles of straw, this latter being the result of an experiment conducted by the Collector. The results of cultivation by ryots, were reported in May 1871, from which it appeared that the experiments had failed, it is to be presumed from carelessness on the part of the cultivators.

Nellore.—Unsatisfactory reports were received from Nellore in 1866, 1868, and 1869, want of care in the cultivation being the reason of the failures. In April 1871, a very full and satisfactory report was received from the Deputy Collector at Naidoopet. No pains appear to have been spared to make this experiment a success. Three different systems of cultivation were tried, namely, sowing broadcast in seed-beds (to be afterwards transplanted), and in furrows, in this latter case a kind of hoe being used. The land was ploughed and manured as for ordinary paddy, one field being ploughed dry and the other two wet. The seed sown in furrows was not steeped in water nor prepared in anyway, and it was sown in the field which had been ploughed dry. The land in this case was not irrigated at all until the plants were eight to nine inches in height, or a month after sowing, and before irrigation the ground was twice turned up with a hoe between the furrows, and the crop was weeded. After watering had been commenced it was continued, and the crop was again weeded two months and a half after sowing. The crop was sown on the 18th of August, and reaped on the 2nd of the following January. The out-turn was not greater than that of ordinary paddy, but this was because only five per cent. of the seed sown was supposed to be vital, and it was confidently asserted that had all the seed sown been good, the yield would have been very much more than that of any indigenous paddy. Both the other crops failed, and, as will appear from a report of experiments made by Dr. Thompson at Chingleput, it seems probable that the plan adopted by the Deputy Collector at Naidoopet, of dry-sowing and irrigation after the lapse of a month, is favourable to the growth of the American plant.

Kistna District.—Reports were received from the Kistna District in June 1868, September 1870, and April 1871. The experiments do not seem to have been very successful. Various methods of sowing were adopted, and in some cases the seed was prepared by being soaked in water. The most successful result was an out-turn of eighteen fold; but the report does not state in what manner the crop was cultivated.

Godavery District.—The experimental cultivation of Carolina paddy in the Godavery District, was reported an entire failure until the present year. Reports were received in December 1866, January and April 1868, and August 1869, and the failures were attributed in Ganjam as to the peculiar method of cultivation [illegible]. The latest report, however, is much more favourable. In this case the seeds were soaked in water for sixteen hours, then [illegible] for nine days, and then sown. The crop was reaped on "[illegible]" and was transplanted. According to the report it shows that 6 pounds and 8 ounces of [illegible] Carolina paddy seed produced 2,464 pounds of rice, the yield from [illegible] pounds of Indian seed being 2,460 pounds. It was found that the American plant is liable to be damaged by over-irrigation.

Ganjam.—This latter characteristic of the Carolina paddy was mentioned in the reports received from Ganjam, the first of which is dated December 1866. Further reports were forwarded in September 1867, December of the same year, February, March, and December 1868. In all the experiments made, the method of cultivation was similar to that of the superior kinds of indigenous paddy, and it was found that a dry season was most favourable to the cultivation of the American paddy. The earlier experiments made in this district appear to have been fairly successful; but the later reports are not satisfactory, and the failures are stated to arise in most cases from carelessness on the part of the cultivators.

Kurnool.—A favourable report was received from Kurnool in February 1867; the seed was sown in the same manner as the Indian paddy, and the out-turn was nearly half as much again. Other reports were received in April and May 1868, and in the same months in the following year, but with one exception they were unfavourable. The trial reported on in April 1869, was a success, the out-turn being fifty-fourfold. This crop was a wet one, and had been transplanted. The latest report from this district is dated November 1870, and is unfavourable, the cause of failure being, as in so many other cases, want of attention.

Vizagapatam.—Several reports were forwarded from Vizagapatam, but the cultivation of the American rice in that district seems to have almost entirely failed. In August 1869, out of eight experiments reported on, two only were in anyway successful. But little interest appears to have been aroused among the native cultivators. Their indifference and consequent carelessness is probably the cause of the failure.

Salem.—The Carolina paddy appears to have thriven well in the Salem District. The reports are dated April and August 1867, December 1868, and October 1869. In some cases the out-turn was sixtyfold, and in another as much as seventy-sixfold. This crop was sown in the early part of August, and reaped at the end of November. The advantages of the American over the Indian rice were fully recognized, and in a report from Mr. Fischer, the Agent of the Shevaguinga Estate, the whiteness and superiority of the rice is noticed, and also the fact that the grain is not so liable to drop from the stalk when cut, as in the case of ordinary rices, thereby preventing waste. This same characteristic of the American rice is noticed in other reports, but rather as a disadvantage on account of the supposed difficulty of threshing. In the experiments made in this district, the seed was sown broadcast and was not transplanted, and it was noticed as in other districts, that less irrigation is required than with indigenous paddy.

Tinnevelly.—The earlier reports from Tinnevelly were not favourable, and the failure in some cases was stated to be caused by the seed having deteriorated from age. A full and satisfactory report was received in August 1870, of an experiment made by Dr. Thompson, Superintendent of the Jail at Palamcottah. When in charge of the Jail at Chingleput, Dr. Thompson had given his attention to the cultivation of Carolina paddy, and a very full and favourable report was forwarded on that occasion. The reports received from Dr. Thompson, will be noticed further on.

South Arcot.—The experimental cultivation of the rice in South Arcot appears to have been on the whole successful, although a great deal of the seed supplied to the cultivators was bad, being too old. The ryots were stated to take an interest in the culture of the new grain. Several instances are mentioned in the various reports of a fear which seemed to possess the ryots lest the cultivation of so productive a species of rice should entail some addition to the assessment on their lands, and in one report from South Arcot in July 1866, it was observed that in one of the most successful experiments by a ryot, a false report of the out-turn had been made, and the crop which was in truth very large, represented as very poor.

Tanjore.—The experiments made in Tanjore cannot be considered successful. In a report dated June 1867, the Collector states that out of nineteen trials only two could be considered in any way successful. He alludes to the known method of planting this rice, broadcast, in America; but observes that transplanting appeared the better method in this country. The two crops which succeeded were both transplanted. It may be here observed that in their orders on an unfavourable report from Ganjam in March 1868, Government recommend that the Carolina seed should be sown broadcast and not transplanted.

Several of the experiments in Tanjore were stated to have failed from the inequality of the rain supply. The latest report dated April 1871, was not encouraging. It is stated that more labour is required than for the cultivation of ordinary paddy. The land has to be ploughed deeper, and more caution is said to be required in transplanting. The difficulty of separating the grain from the stalk was also made an objection, although the same was quoted in other reports considered above, as a great advantage.

South Canara.—The earlier reports from South Canara in 1867, 1868, and 1869, showed that the same characteristics had been recognized in the American rice as in other districts; but the results

of the cultivation were not very successful. The seed was sown in the same way as native paddy. In 1868 the crop was transplanted, but was reported to be damaged by flooding, thus confirming the reports from other districts as to the liability of the plants to suffer from too much water.

The report in 1869 was more favourable. In two experiments the yield was seventy-fourfold and fourty-fourfold respectively. The crop in the first was transplanted and in the latter sown broadcast; but it appears to have been sown too thickly. From a report received in July 1871, it appears that the experimental cultivation in the previous year was not successful.

In two cases where adjacent crops had been sown, the one broadcast, the other transplanted, the former far exceeded the latter in yield and quality. These two crops were sown on one-crop land, whereas other seed sown on two-crop land entirely failed. It appeared also from these experiments that Carolina rice does not require so much manuring as Indian paddy. The crops appear to have been irrigated from the time of sowing, and the failure was probably owing, as in other cases, to over-irrigation. The most successful experiment appears to have been conducted by a wealthy proprietor in the Kusargod Talook. In this case the ordinary native method of cultivation was employed, and the seed sown broadcast and not transplanted. The cultivator in this case was quite satisfied with the result, and has sown a considerable extent of land with Carolina paddy.

Madura.—The first experiments reported from Madura in August 1867, were not very successful. The seed was distributed to several native cultivators and the usual method of sowing adopted, which in this district is by transplanting. Some of the seed was also sown broadcast. The season was very unfavourable, but the ryots reported that but for this the yield of the Carolina would have greatly exceeded that of the native paddy. Failure was again reported in July 1869, and in this case it was attributed to the deterioration of the seed from age.

Bellary.—The report from Bellary in September 1867, corroborates the other reports as to the nature of the American rice, and the experiment was fairly successful. The seed appears to have been sown broadcast too thickly, and the soil was inferior, otherwise the out-turn would have been large. A further report from Bellary states that the experiments conducted in the following year were not very successful. The same method of sowing as before was resorted to, and the greatest out-turn was thirty-fourfold.

Cuddapah.—From a report received from Cuddapah in June 1868, it appears that the season was very unfavourable, and that of eight trials made by native cultivators one only succeeded. In this case the seed was sown in the ordinary way and no extra expense was incurred. The out-turn was nearly sixtyfold. In an experiment reported on in March 1870, great care seems to have been taken in the preparation of the ground, which was ploughed and watered a month before sowing, and received afterwards two ploughings each day on the fifth and second days before sowing.

The land was manured with leaves and dung and again ploughed, and the seed (which had been kept moist for three days after 12 hours' previous soaking, was then sown. The land was irrigated on each ploughing and on the day of sowing, but the water was not again let in till the plants appeared above the surface. The irrigation after that was continuous. The result however was not very satisfactory, the yield being less than that of ordinary paddy; the grain and straw were as usual of superior character.

Coimbatore.—The first report from Coimbatore was unfavourable; the want of success was attributed to indifference on the part of the ryots. A report was received in December 1869, of a very successful experiment conducted by a Mussulman ryot; the same features were observed as in other successful experiments. In a report on the cultivation of Carolina rice in this district from the Superintendent of the Government Farm, Sydapet, it is distinctly stated that by being sown broadcast, American paddy is placed at a disadvantage as compared with Indian paddy, which is generally sown in seed-beds and transplanted. One cause of frequent failure is also suggested. The American paddy is frequently sown at an unusual time of the year, and being, when ripe, the only ripe crop, is thereby more exposed to destruction by insects, birds, &c.

Trichinopoly.—The experiments made in Trichinopoly seem to have failed entirely.

Madras.—The reports from Madras include that received from Dr. Thompson, when Superintendent of the Jail at Chingleput, as well as reports from the Superintendent of the Government Farm at Sydapet. Dr. Thompson reports very fully, and the result of his experiment is most satisfactory. It will have been observed that in nearly all the experiments reported above, the seed was first soaked in water and sometimes kept moist. Dr. Thompson on the contrary had the seed thoroughly dried. Both wet and dry cultivation was tried, two crops of each being sown, the one broadcast and the other in seed-beds for transplantation. The land was prepared for the wet crops in the usual way, the seeds in this case being sown wet. The land was continuously irrigated, and one crop was transplanted from the nursery when about a month old.

The broadcast crop was reaped first, the other having been thrown back by the great heat at the time of transplanting, but recovering and giving, it is said, an out-turn of one hundred and twenty-threefold. The land for the dry crop was well ploughed, cleared of leaves, and levelled. The seed was sown dry and for some time both dry crops seemed unlikely to thrive. They were, therefore, two months after sowing, converted into wet crops, and the result was an out-turn from the transplanted crop nearly equal to that of the transplanted wet crop, while the broadcast crop turned out the most successful of all. In their remarks on this result the Government observed, "The seed was sown in August, "having been previously well dried. The soil was sandy clay enriched with silt from the bed of a tank, and, where wet cultivation was employed, leaves were incorporated with the soil of "the nursery bed. But a larger share of success appears to have "attended the cultivation of the paddy which was sown broadcast on dry land, and not irrigated until two months had elapsed." If the results of the experiment made by the Deputy Collector at Naidoopet in Nellore be compared with this, it may be inferred that this postponement of irrigation (although, in the experiment at Chingleput, accidental) is highly favourable to the growth of the Carolina paddy.

The experiment made by Dr. Thompson at Palamcottah was reported on by the Superintendent of the Government Farm. Among the reports from Madras is one received in June 1869 regarding experiments made in the sub-division of the district, which seems, notwithstanding, an unfavourable season, to have been highly successful. In one case, a Carolina rice-crop grown alongside one of the best native paddy, and under precisely similar circumstances, yielded one-and-a-half times as much as the latter. The advantages of the American rice are thus summed up:—

"(1.) It is a four months' crop.
"(2.) It requires not more than one-fourth of the water required "for the native kinds of paddy during the same period.
"(3.) Twenty-four measures of seed suffice for the same extent of "land as thirty-two measures of native seed.
"(4.) Each seed that germinates is capable of producing from ten "to seventeen plants without any particular care, a productive "power not possessed by native paddy to any appreciable extent.
"(5.) The ears are, out of all comparison, larger than those of "native paddy grown under the most favourable circumstances.
"(6.) The largeness of its yield.
"(7.) Its superiority as food-grain.
"(8.) It yields a larger amount of straw of a sort also more succulent and palatable than that of ordinary paddy."

In this last point the report is somewhat at variance with most of the other reports received. One important point is noticed showing the estimation in which the American paddy is held, namely, that, whereas some months before the report was drawn up, the seed sold for 1 anna a measure (the same as native seed), the price had risen to 2 annas a *measure*.

Nilgiris.—According to a report received from the Nilgiris in March 1871, the experiments tried there were complete failures. The seed appeared to thrive until transplanted, when in every case it died. Hares and cockchafers were supposed to have destroyed the young plants. In addition to the foregoing, reports were received from Travancore and Mysore. In the latter territory the cultivation of the paddy (in Bangalore) was successful, and the grain appreciated by the native cultivators. The reports from Travancore and Cochin are moderately favourable, and coincide as regards the qualities of the paddy, with other favourable reports. In Travancore it was also noticed that the best soil for its cultivation is a mixture of clay and sand. Experimental farms were established by the permission of Government (recorded in September 1869), in the Kistna District and in Cuddapah, South Arcot, Madura, and South Canara, and some of the later experiments in these districts were conducted under the supervision of the Collectors and their Assistants. In March 1870, the Board forwarded a report to Government of the result of the experiments up to that time, of which the following is an outline:—With reasonable care and exertion Carolina paddy may be grown in most districts with profit. Failure, as a rule, has been attributable to causes quite within control in the average of seasons, and where real care has been taken, success has generally been the result. The Carolina paddy is harvested as quickly as the most rapidly growing native grains, and twice as quickly as most others, and is more productive in weight of grain and straw and less dependent on a full supply of water. A smaller quantity of seed also suffices. There appears from a review of all the above-mentioned reports, to be little to add to this statement of results, though one or two points regarding the preparation of the seed and the land may be noticed. It appears to have been usual to soak the seed and to sow it wet; but in one of the most successful experiments made, namely, Dr. Thompson's at Chingleput, the seed was well dried and then sown in dry soil. The reason given by Dr. Thompson for the preliminary drying of the seed is this:—On examining some of the seed [illegible] off the husk, a white [illegible] and diminishing the size of the germinal spot, thereby [illegible] it

[illegible] Dr. Thompson states that he acted thus on the advice of an experienced native cultivator.

As to the preparation of the soil, deeper ploughing and less manure [illegible] are required than for native paddy, and as mentioned previously, the postponement of all irrigation for a month or two seems worthy of further trial. As regards results, the [illegible] of the advantages of Carolina paddy contained in the "Resolution" of the Government of India, has been almost entirely [illegible] by the experiments hitherto made in this Presidency. Of the three disadvantages named in the Resolution, the second and third have been found to exist, but not the first, for on all hands the superiority of the grain in colour and flavour has been recognised, and as appears from the report from Madras, this quality has commanded double the price of native paddy. In conclusion, it may in a few words be asserted that Carolina paddy is in every way superior to native paddy, but that it is the growth of a higher system of cultivation than is generally prevalent in this country, which system is required to bring it to perfection and to prevent its deterioration. It is in the early stages of its growth more delicate and requires more care, especially in sowing (so as to prevent its being sown too thickly), than is usually the case here. The seed also is liable to deterioration. In the foregoing report no mention has been made of the cultivation as carried on at the Government Farm at Sydapet, as the Superintendent of the Farm has undertaken to compile a full report of the cultivation of the Carolina paddy throughout the Presidency, for which purpose copies of all reports and statements are forwarded to that gentleman when received by the Board, and a report concerning the results obtained under his own personal inspection will, it is presumed, form part of the report promised. A copy of these Proceedings will be forwarded to Mr. Robertson, who is requested to be good enough to state whether his promised report concerning Carolina paddy will be incorporated with the general report called for by the Government of India, and if not, when the former may be expected.

RHEEA FIBRE.

In a number of the *Edinburgh Scotsman* brought to us by the last mail, we have an account given of the trial of one of the machines for the cleaning of the rheea fibre which is to appear at the competition at Saharanpore for the prize offered by Government as a reward for the best machine constructed for that purpose. It will be remembered that the Indian Government, announced about two years ago, its intention of offering a prize of Rs. 5,000 for the best machine capable of cleaning the valuable stems of the rheea plant at a cost of £15 per ton, and admitting of the sale of the fibre in the English market at £50 per ton. The fibre of this plant is the strongest and most valuable known; but from the peculiar gummy character of its stem, it has hitherto been found impossible to separate the fibre from the skin in the same manner as flax, hemp, jute, &c., by water retting, or macerating in water for several days to get rid of the vegetable matter. It is therefore necessary that the skins should be scraped away from the underlying fibre while the plant is in a green state. By this means its great strength, lustre (equal to that of silk) and whiteness are preserved. The plant has been described by many Indian writers, but it is known in several countries though under different names. It seems to be the same as that of which the beautiful China grass-cloth and other silky fabrics of that character are made. Its botanical name, we are told, is *Bochmeria Nivea*, or *Urtica Tenacissima*, which shows it to be of the nettle family. Indeed it is very like our common nettle, but is stingless, and much stronger. It is perennial. The roots form in great clumps, and send up green stems or shoots all round. These, as soon as they have reached the height of four or five feet, are cut down close to the root. Other shoots then spring up, and are ready for cutting in two months; so that with irrigation, rich soil, and a moist climate, as many as six crops have been obtained from the same stock within one year. The plants are propagated from cuttings, layers, dividing the roots and from its seed, although the last-named method is the least resorted to. As already mentioned, rheea is the strongest of all vegetable fibres, and at the same time finer than the superior kinds of flax; and, when prepared ready for spinning, has the lustre of silk, with which it is intended to be mixed. It is capable of being cultivated in all tropical climates, but, as present is chiefly reared in Northern India. Its value in a national point of view is therefore great; but the difficulty of cheap separation, or preparing it in sufficient abundance [illegible] prevented its introduction by our manufacturers, which, as a rule of commerce, [illegible] is only known by name. We all know [illegible] the importance of a new fibre or an [illegible] Government, convinced the Lieutenant-Governor of Bombay, instead of [illegible] the above-mentioned prize on offering, who should invent a machine capable of being worked so economically as to allow of the fibre being sold in the London market at £50 per ton. It means that Mr. John Greig, jun., of the well-known engineering firm of R. & J. Greig, Edinburgh, had in 1869, while in India, two years before Lord Mayo's meeting the matter, with the aid of an eminent and enterprising merchant in Bombay, constructed a machine for the purpose of cleaning the fibre. This first attempt resulted in the construction of a machine capable only of cleaning half the stems at a time. Mr. Greig determined, on seeing the Government conditions, to construct a machine that would clean the whole length of the stems rapidly and by a single operation, the apparatus itself turning over the ends, which require to be held firm while the other portion is being scraped. Mr. Greig set to work in the preparation of designs which he forwarded to Edinburgh, and afterwards followed them in person to superintend their execution. We are told now that the machine has been completed, and that at a public trial, previous to its being taken to India, the result was held to be most satisfactory, and is thus described. The stems with which it was tested were from three feet to five feet long, and averaged half-an-inch in diameter, tapering to a small point. A quantity of this are laid on an endless travelling web or (end-table, by which they enter the machine between a series of fluted iron rollers, which break the inside cores in short pieces, and flatten the green skin, where the fibre lies underneath an outer coating of tenacious mucilaginous vegetable substance. In order to clean the stems by mechanical process, they must be scraped by knives having a rapid circular motion, and while being scraped, the skins must be firmly held. In consequence of the scrapers rotating and the rollers which hold them being circular, there must be a portion of the length of the stems left untouched, representing the distance between the centres of the scraping cylinders and the centres of the gripping rollers. Herein consists the novelty of the invention. The small ends as they pass down are cleaned, and immediately blown by a simple contrivance between a pair of elastic catch-rollers, whence they are thrown out on the delivery web. The moment the crushing rollers let go the last portion or thick ends of the stalks (seven inches of which are still to scrape), the latter are thrown down (by the momentum given to them by the upper scraping cylinders and by their own weight) between another pair of scraping cylinders, which completes the cleaning of the whole length of the stalks, and this is done while the fibre is still held firm and travelling out of the machine by the delivery web. Thus the object of the machine is accomplished, viz., to clean a large quantity of rough rheea stems the entire length by one operation. It is equally suited however for clearing any other description of fibre. Although it executed its work in a very easy and perfect manner, it is but right to state that the machine worked under certain disadvantages. It is quite new, though of beautiful workmanship, and was therefore somewhat stiff in action; and the rheea stems were greatly decayed, some of them indeed being almost rotten, in which condition it is very difficult to separate the fibre from the skin, as after being cut a few months, gum penetrates into the former. Nevertheless, on the stems being beaten by the ordinary flax scutcher, after passing through the machine, they were as perfectly cleaned as if they had been done by hand. The difference in production however between the two systems is immense. By hand each individual stem has to be cleaned by a tedious process while the machine worked by steam, and attended by say four coolies, will turn out the fibre at the rate of about 20 feet per minute in a "layer" 24 inches wide. At this rate, there is little doubt that Mr. Greig's machine will be able to produce unlimited quantities at a lower rate than the £15 per ton specified by the Government; and it is probable that within a few years the exports of rheea may rival those of jute from India. Mr. Greig will now be on his way to India with his invention, which we trust will be found worthy of the prize offered by Lord Mayo. Mr. Greig has spared neither time nor trouble in bringing it to its present efficiency, and we trust he may meet with the coveted reward for his great enterprise and ingenuity. Mr. Greig will have His Lordship's best reward, should the experiment prove successful.—*Deccan Herald.*

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

The usual Monthly General Meeting was held on Thursday, the 21st December 1871.

The Secretary read the following remarks by Mr. John Scott, on a vegetable substance found occasionally in the Neilgherry Hills:—

"The specimens sent from Coonoor under the name of "little man's head" are the dried tubers of a salep-yielding orchid: the entire tuber being incrusted with an epiphytic lichen, while the other which is cut and pitted, is as you remark, something like the '*salep mirum*.' Both are evidently however of the same species, and very probably, one or other of the Neilgherry Satyrium,

Though the colour of these specimens is much less pure than the salep *misree* of the bazaars, they seem none the less rich in bassorin, so that extremely hard and horny though they are, portions of them immersed in boiling water readily swell up and acquire a gelatinous character. The specimens sent by Mr. Whynton must (judging by their hard and bony texture and lichen-coverings) have been dead for years, and it would be well to suggest to him, that in his future promised hunts for the 'little man's bread, he also sends fresh pseudo-bulbs or tubers of the terrestrial orchids which may then occur: this may enable us to determine the species which yields the 'little man's bread.'"

Sample of raw fibre from Sylhet, forwarded by the Officiating Collector.

Mr. Sutherland thus writes regarding this fibre:—I have the honor to forward herewith, for examination by your Society, some specimen of the fibre sent by Mr. W. Foley, who remarks thus:—"The fibre which I sent over some time ago was obtained from a plant called in the vernacular "oolta kanal;" it is found all over Bengal. I saw the plant in Rungpore, when I was in that district some years ago. It thrives on teelahs and high flat lands, and is propagated by seed which ought to be put down by the end of February or the early part of March. In good virgin soil, the plants will attain the height of 9 or 10 feet within the first year. The great advantage of this "oolta kanal" is that it is a perennial, and when cut down, (which should be done about a foot from the ground), it throws out a number of shoots; the stalks are treated precisely the same way as jute stalks. I believe a second crop may be obtained during the year. I tried the experiment on a small scale, and I obtained only few seeds, and that late in the season. I have now a quantity of seed and will try the experiment on a large scale, and will furnish you with further particulars.

The fibre in question is the produce of *Abroma augusta*. Mr. Hutchinson, of Messrs. Toulmin & Co., considers it good, and is of opinion that it might be used with advantage by rope-makers for mixing with Manilla hemp;—value £35 per ton.

Mr. John Martin submitted some apples in an excellent state of preservation with the following note:—"I have the pleasure to forward for the inspection of the Members of the Horticultural Society some English apples (Ribstone Pippins) picked by me from a tree in my garden in Devonshire, in the middle of September last. When picked they were tolerably ripe. I had them carefully rolled in tissue paper and with some soft clothing put in the bag in which I now send them. They were sent overland *via* Southampton, and arrived in India on the 22nd October. As you will see they are still in excellent preservation, though they have already been two months in this country. Judging by my success with these apples, I have no doubt, with ordinary care, many fine kinds might be brought to India."

HORTICULTURAL NOTES.

Submitted the following extracts of letters from Mr. S. Jennings of Allahabad:—

15th December.—"I have just received an excellent batch of cuttings from England, packed in moss, by sample post. Nearly the whole were fresh and green, and I entertain the strongest hopes of saving 10 out of 15, a very good proportion I think. They were planted in a mixture of sand and leaf-mould, under a glass frame, and consist of the following, all of which I believe are new to the country and will be great acquisitions. They are *Crotons*,—Johannis, multicolor, undulatum, maximum, interruptum, irregulare, and Vietchii. *Dracænas*,—Guilfoylei, Regina, Macleayi, Moorеana and magnifica, *Ixoras*,—Colei, Dixiana and crocata rutilans."

19th December.—Advising despatch of a further collection of bulbs and a box of roses, a well known Nurseryman in London, gives the following instructions. I send them to you for general information, if you think them of sufficient interest.

"*Achimenes*, *Gesnerias* and *Gloxinias*—Shake out the material at once and re-pot in a mixed light sandy soil, just covering the roots, that is to say, about ¼ an inch of soil over them, and place them in a bath-room where there is plenty of warmth, and keep up a moist atmosphere by frequently syringing of the walls and throwing water about the floor for a few days; then syringe them slightly at first, still keeping up the moist atmosphere around them, and as the foliage develops itself, you will increase the quantity of moisture. They prefer shady situations for growing in.

"*Caladiums* will require the same treatment, except that the crown of the bulb must stand above the soil, and they must not have any water on them till they show symptoms of growth. This will be induced by the damp atmosphere and the warmth of the room. Immediately they commence developing their leaves, give water moderately, and ultimately stand them in pans of water, or plant them out in marshy situations, or places where they will get plenty of irrigation.

"*Amaryllis* including *Vallota purpurea*—Plant out or shift into 7-inch pots, and let them have the bath-room for a little time just to excite growth; you may then put them where you please.

"*Curcumas*—Treat much as you would *Caladia*.

"*Begonias*.—Let them remain in the pots they are sent in, being established there, when they commence growing, shift them into pots a size larger, and when in full growth, they take water freely.

"*Eucharis*—Shift this at once into a larger pot. Give it a few days in the bath-room, in a damp atmosphere, after that give it abundance of water and warmth. If you have a pond, you may plant it in the margin, where it will be flooded occasionally. It delights in moisture and is a native of the Brazils where heat and moisture prevail. *Imantophyllum* will do very well where the *Eucharis* does.

"*Cyclamen persicum*—If you plant them out, be sure that you put a considerable amount of rubble, brick-bats, anything in that way, either incorporated with the soil or what is better a foot or eighteen inches under the bulbs, and about a foot of soil above the rubble. Three things *Cyclamen* dislike, 1st, too much moisture at the root; 2nd, too much exposure to the sun; and 3rd, cold winds. How hot winds will affect the plants will depend upon their being in leaf or dormant at the time.

"Lillies prefer a moderately stiff soil, and like growing where there is a little shade. They must not have any manure except in a clear liquid form when they are in growth, and you may give as much as you like then. The plant likes it, but it is death to the bulb to have any gross manure about it. Grow lillies either in pots or plant them out. If the latter, let them have shade at the roots and attend to them with moisture in dry weather.

"The *Clivia* will take the same treatment as Imantophyllum.

"*Gloriosa*—The same as Achimenes.

"As to the roses, 1st, when the case reaches you, place it in a dark room and unscrew the lid. The second day let a very little air in. The third day remove the lid. The fourth day unpack the roses, then pot them at once, and place them in a bath-room syringing the sides of the room to give a damp atmosphere, but give no water at the roots for say a week. Twice a day syringe the roses just to moisten the wood, and at the end of the week give just a little water at the roots, and as the plants show symptoms of growing, increase the water. When out of all danger, and you know that they are alive, gradually accustom them to the air, then cut back to within three or four eyes of where they were pruned last."

The only point upon which I have doubts is the advisability of planting out *Achimenes*, *Gloxinias*, and *Caladia* when received, instead of keeping them dry till March and April; the rest is good useful advice.

MISCELLANEOUS COMMUNICATIONS.

Letters were submitted from Lieut. J. F. Pogson, suggesting the introduction into Upper India of the gigantic yam of British Burmah. The following is extract of Mr. Pogson's letter:—

"I may here mention, that the "*Climax*," potatoes, were very superior, and as two gentlemen in this station have now a supply of them for next year's sowing, this valuable variety will soon be established.

"The potatoe disease has apparently extended to all potatoes raised in Simla. Those sent for sale to this station are very fine to look at, and of large size, but when boiled they are yellow and waxy, and have a peculiar smell. The best in the market are small potatoes, and of these one-half show signs of disease.

"When the entire stock of this diseased potatoe dies out, there will be some chance of better varieties being introduced by the authorities, in the meantime however I think it would be advisable for the public good if some other vegetable was introduced for general consumption. Colonel Brown, the Deputy Commissioner of the Mergui District, British Burmah, has recently submitted his Report on the "Selons," and states that this peculiar race of people spear fish and wild pigs which constitute their principal articles of food. Turtles and shell-fish also afford them subsistence, together with yams, which grow on the islands, and are sometimes found of thirty pounds weight.

"If this splendid yam was introduced into Bengal, the N. W. Provinces, Oude, and the Punjab, we should have something to fall back upon when potatoes are not procurable; and it is just possible that the natives will eat boiled and roasted yams, if they can get them at the same price as rice, or inferior flour

"The constant recurrence of famine shows that something should be done to meet the evil, and about the simplest plan would be the formation of plantain plantations, in the vicinity of villages, far removed from high roads and railways. The yam planted near a plantain, will come to perfection, even if the fall of rain is slight, and with these two additions, to the ordinary stock of food, the advent of a drought need not be looked upon as a dire calamity, which can only be met by appealing to the European public for charitable subscriptions.

"There are few villages in India, so highly cultivated, as to have no officially recognised waste, or uncultivable land, and as such land will answer for plantain cultivation, official sanction to grant it free of cost (or revenue) is all that is needed to start the project; of course where the plantain is unknown, the authorities will have to supply young plants.

"I feel certain that if the Government was once convinced of the great value of the plantain, as a producer of food, that it would offer inducements to the ryots and zemindars of districts, such as

long table to bother to grow plantain by the side as regular crop. We are told by Baron Humboldt that "the same space of a thousand square feet, which will yield only 22 lbs. of potatoes, or 33 lbs. of wheat, will produce 4,000 lbs. of bananas, and in a shorter period of time."

"The unripe fruit is sometimes used as bread; it is dried in the oven, and in this state is eaten in the manner of bread. When thus dried, it may be kept for a long time without spoiling, and is usually carried with them in this dry state by the natives when they are proceeding on a long journey."—(*Vide Chemistry of Common Life, Professor Johnston*, pp. 106 to 111.)

"In tropical America, about 6½ lbs. of the fruit or 2 lbs. of the dry, meal, with ¼ lb. of salt meat or fish, form the daily allowance for a labourer, whether slave or free.

"The plantains of Martaban and Burmah are famous for their size and flavour, and very good descriptions exist all over Bengal Proper, so there can be no difficulty about obtaining young plants and suckers; and if the experiment of planting them was tried in the District of Sirsa, where famine is now raging, (*vide* Mr. Deputy Commissioner R. G. Melvill's letter), the starving poor would have the satisfaction of knowing that they have seen their last famine."

It was agreed that Col. Brown be addressed on the subject.

From the same on the subject of the Mako and Makoe plants, with reference to previous correspondence.

"I have noticed "observes Mr. Pogson," the remarks on the subject of the *Makoe*. (Sarsparilla) which appears in the Society's Proceedings of 23rd November last. The "*Mako*" of Shakespear's Dictionary is distinct from the "*Makoe*" of the same work. *Mako* means name of a species of Solanum (Nigrum). The word *Makoe* is Sarsparilla, *vide* Dictionary. This latter plant has a leaf very like the "Zizyphus Jujuba." There is lots of it in the jungle at the foot of the hills, and its fruit is by no means bad, being somewhat like a small "*Bair*," size that of a large marrow-fat pea; colour deep purple like the "*Jamoon*." I believe the kernel of the seed is edible. I will secure samples if I go to the Sewallicks."

The Foresters' Gazette.

BOMBAY, 21st FEBRUARY 1872.

FOREST CONSERVANCY AND LEGISLATION.

We published recently a collection of most valuable papers on Forest Conservancy. They convey the result of M. Eugene Tallon's examination of the question of reform in Agriculture and Irrigation, so loudly called for in France after the fiery ordeal that unhappy country went through, during one of the greatest conflicts between nations that have ever agitated the face of Europe. It was the perusal of this report to the French National Assembly that induced us in our last issue to call the attention of Government, as well as of the public, to the great importance of woods and forests in tropical climates. If it be deemed essential to preserve forests in the more favourable and humid countries of Europe, how much more essential is it to secure and encourage the existence of such a grand agency of humidity and rainfall in tracts where the sun in his glory, and in the absence of counteracting influences, burns and dries up the exposed soil. It will be seen that even before the recent disastrous war, France had resorted to legislation to cover her mountain sides with trees, as one of the essential steps in the course of agricultural progress; and this system of promoting the larger vegetation had its good effect, we are told, in the undoubted mitigation of the violence of storms, in the greater uniformity of the rainfall, and in the paralyzing of the disastrous alternatives of sudden floods and prolonged droughts, which are the very ruination of any country. The chief feature in the report however is the pointing out of the errors that had been made in legislating for arboriculture, of which compulsory plantation seems to have been the principal element. The discovery of these errors suggested a revision of the laws, to consist in the abolition altogether of the system of compulsory planting both in public and private lands; the continuance of Government subventions, in money and kind, to public bodies and private persons as an inducement to plant; the encouragement in some cases of re-turfing in lieu of re-planting; and the introduction of a sort of self-government in the election of agricultural committees to fix the areas of the lands to which grants-in-aid were to be made. Is it not possible for us, in the inevitable legislation that must sooner or later take place, to avail ourselves of M. Tallon's suggestions in order to avoid the mistakes committed in France? Our attention has been still more forcibly directed to this subject by perusing another report, on the mountain system and distribution of the forests and the water-supply of Algeria. From the description given by M. Jules Duval in the *Economiste Français* there would appear to be a remarkable analogy between Algeria and India in respect to climate, influence of climate, fertility of soil, and atmospheric influences. The periods of rain and drought may not exactly correspond; the similarity consists in prolonged drought for several months and a periodical fall of rain within a limited time, when the river-beds and hollows fill with water which impetuously rushes away to the sea. The language which M. Duval employs, in advocating successful administration in Algeria for the promotion of the physical welfare of its inhabitants, is singularly applicable to the condition and requirements of India. "Since there is always a risk in Algeria," writes M. Duval, "of failure of the water-supply for agriculture, intelligent cultivation and policy should unite in the application of their entire force to utilise all the water which falls from the clouds, which flows over the earth, and which penetrates the soil. Since rain falls only in winter and is altogether absent in summer, the excess of the winter fall should be preserved for the necessities of summer. Every influence favourable to atmospheric humidity should be developed by natural methods, viz., by the conservation of existing woods and the planting out of others. The pasturing of cattle in the woodlands, which involves the destruction of the young trees, should be forbidden or checked with vigilant severity, at any rate on the highlands: means should be taken to prevent (or, at least, to punish the originators of) the fires which ravage the forests—profound forests which formerly nurtured the elephants destined for the Roman Circus." "Not only have streams of liquid gold and silver been allowed to run down to the sea, but Arab cattle and Arab fires have been allowed to devastate the forests, *i.e.*, to increase the natural dryness of the country; and when the Forest Department, understanding and doing its duty, endeavoured to repress these abuses, it was accused of odious interference with native customs; when just sentences were pronounced against the incendiaries, they were freely remitted as an act of grace. Following on this, Algeria was divided into longitudinal zones, which for purposes of surveillance, separate the heads of the rivers in the south from their courses and termination towards the north. Thus, the forests, those precious sources of humidity, have everywhere, notwithstanding the wishes of Councils-General, and in spite of the protests of the press, been more and more abandoned to devastation. The Arabs have reaped famine and drought as the result of scattering cattle and fire through the woods, a fatal expiation which, following the law of universal order, creates evil from evil, as it brings forth good from good." Every line of this might have been written at all events a few years ago, of Southern India. Referring to the grand requirement in Algeria, just as in Egypt, Greece, Italy, the south of France, and Spain, "water," emphatically exclaims M. Duval, "more water, and more water still, such is the pivot on which agriculture in these countries turns even more than on railways. Allied with heat, water endows the soil with prodigious fertility; while, on the other hand, soil of the best composition remains sterile without irrigation." And how is this great desideratum to be secured? As in Algeria, so in India, by the conservation of forests and the construction of dams. These two must go hand in hand. The forests will provoke humidity and rain; rain will create rivers and streams; and dams must be built to prevent the water running to waste into the sea. At present, however, we have only to do with forests, which we are told act in two ways—as agents of absorption, and as agents of evaporation. It is the opinion of M. Marie-Davy and other French authorities that in uncovered, and especially a light soil absorbs a larger quantity of water than a wooded soil; but this doctrine is combated as being only true of plains and perhaps very gentle slopes. Wherever there is a slope more or less steep,—and of course this would be especially the case with our mountain sides,—absorption takes place in proportion to the diminution in the rapidity and volume with which water flows along the surface, taken in connexion with the permeability of the soil itself. In this point of view, therefore, it is thought that forests, by dividing the currents of the water and opposing resistance to its flow, present advantages for absorption not to be looked for from unwooded soil, which in some cases cannot resist the movement of the mass of water, and is consequently washed away; so that in many cases both soil and water are lost for the purposes of cultivation. On the other hand, wherever forests exist, there they will retain for the benefit of springs, water which otherwise would be carried away with the vegetable mould; while, by retarding the flow over the surface of the soil, they, in the opinion of the French writer, moderate the rapidity of the rise of the water and diminish the dangers of the floods. Then as to evaporation it is well-known that, in addition to the protection afforded by wooded regions to water-springs, forests spread a portion of the water of the soil through the atmosphere in the form of vapour, thus exercising a most beneficial influence on climate by tempering the excessive heats of tropical regions.

Much has been done in recent years for the preservation of forests in India; but a great deal more has to be done yet, both by departmental reform and by legislation, to spread the benefits already secured to the country, the practical blessing of which we may be said to have already commenced to reap in the better rainfall and the larger supplies of water we have been able to command in the last year or two. In addition to Governmental fields of action, we must also encourage forest planting on the part of private individuals; and

we must diminish as much as possible the unsystematic cutting down of timber for the purposes of mere ordinary fuel. Above all, as M. Duval says in the case of Algeria, we must have water; and to have as much water as we want, we must have the control of its supply. As long as great landholders, often on the verge of bankruptcy, have absolute power to cut down hundreds of square miles of forest, as, for example, in Tinnevelly forest conservancy, which (practically in India) is a term synonymous almost with water-supply, is impossible. Hence, to complete the work of progress already begun, it will be necessary to pass a Forest Act to give back to Government the control over private or communal forests, which ought never to have been given up by the State. The spread of coffee cultivation and tea planting, and the continuous demand of our extending railways for wood fuel, make the necessity for reform more imperative; and although the Board of Revenue have objected to the Forest Bill prepared in the North of India, there is no doubt of the absolute need for legislation that remains to be carried out. Meanwhile we have reason to think that the Board have advised that all private forests in Tinnevelly be taken upon lease, or if necessary, under Act X, of 1870—that powerful engine invented by the State for acquiring land for public purposes. This step however sound as it is, can only be preliminary to legislation, to which we must finally resort to overcome all the difficulties that will be interposed in our way. One of the greatest difficulties with which we shall have to contend, is the unceasing demand of the iron horse. Our railways must have the means of making steam, without which they cannot be worked for the advantage of man or in the cause of commerce. But why should it be wood alone? In parts of Bombay where fuel is scarce, we hear that the railway is not allowed to burn wood at all: and why should not the same be enforced here, when there is a ready substitute in the shape of peat? Peat is easily procurable on the Neilgherries; and we have no doubt that if proper care were taken and sufficient encouragement afforded, large quantities of peat would always be available for the purposes of the railway, or even for domestic use on the hills. A Madras Civilian of well-known experience recently addressed a letter to the East India Finance Committee, in which he included the preservation of wood as one of the subjects to be anxiously considered in connexion with the agricultural prosperity and land revenue of India. He gives it as his deliberate experience that the strict orders of the Home Government for the conservancy of existing woods, and their extension wherever practicable, are being virtually nullified by the way in which whole classes are allowed by Government to cut fuel free of charge; and that in consequence there is a steady denudation going on all over India that has a most serious effect in diminishing the moisture retained after the rains. He is of opinion that when leave is given to cut fuel free of charge for domestic purposes because the people are poor, it is a cruel kindness, as it is simply encouraging the ryots to cut their own throats. We cannot but attach importance to the words of a man who has filled the office of Collector of a district with distinction, when we find him delivering himself in language such as this—"If the existing woods are placed under careful conservancy, and suitable measures are adopted to secure in due course, reproduction, so that there shall be some wood, if possible, in every village, we may depend on there being a steady supply of water all the year through in the small rivers which are left at the disposal of private enterprise, and a steady supply in the wells which play so important a part in Indian Agriculture. It is impossible to over-estimate the importance of this question. The cultivation that is carried on from rivers and wells furnishes a steady employment for labour nearly the whole year round. And wherever this description of cultivation obtains, there a healthy centre is established for the dry cultivation that usually stretches beyond the rice and garden crops. The subject we have ventured to place before our readers is of the deepest importance, because it is pregnant with the future prosperity of India. Let the supply of water fail, and the whole scene is changed. The subject is not a new one. It has been written upon again and again, and the questions involved in its discussion are fully conceded on all hands. But it appeared to us necessary to call the attention of Government to the papers which we publish, and by means of our feeble voice to get the public to see the question in its proper light, and to appreciate the crisis before it is too late.—*Madras Revenue Register.*

FOREST CONSERVANCY.

THE question of the conservation of forests in India is attracting a great deal of attention, and the suggestion has been made to the Government to pass a Forest Act to give back to them the control over private or communal forests, which ought never to have been given up by the State. We admit the necessity of legislation with the object of the preservation of the forests, and we must add that the necessity for such a step is urgent. The denudation of the forests in India that is at present going on must greatly affect the future agricultural prosperity of the country, and unless legislative action be taken to prevent it, the destruction of the forests will increase in proportion to the increasing demand for railway fuel. There must of course be the means of making steam for railways, but peat may be used with as much advantage as wood fuel. In urging the necessity of legislation for the conservation of forests, the *Madras Revenue Register* makes the following observations:—"Much has been done in recent years for the preservation of forests in India; but a great deal more has to be done yet, both by departmental reform and by legislation, to spread the benefits already secured to the country, the practical blessings of which we may be said to have already commenced to reap in the better rainfall, and the larger supplies of water we have been able to command in the last year or two. In addition to the Governmental fields of action, we must also encourage forest planting on the part of private individuals; and we must diminish as much as possible, the unsystematic cutting down of timber for the purposes of mere ordinary fuel. Above all, as M. Duval says in the case of Algeria, we must have water; and to have as much water as we want, we must have the control of its supply. As long as great landholders often on the verge of bankruptcy, have absolute power to cut down hundreds of square miles of forests, as for instance, in Tinnevelly forest conservancy, which (practically in India) is a term synonymous almost with water-supply, is impossible." There has been something like action taken by the Board of Revenue, we understand, to prevent the destruction of forests in Tinnevelly. The Board have advised that all private forests in Tinnevelly be taken upon lease, or if necessary, under Act X. of 1870, which has been passed to enable the State to acquire land for public purposes. But the subject should be dealt with in all its bearings, and legislative measures must be adopted to meet all difficulties in regard to forest conservancy. If we wish to save the country from continual drought and constant famines, we should pay all attention to the preservation of the forests; for the importance of woods and forests in tropical climates cannot be denied. It is well-known that in Europe, the conservation of the forests is commenced to be strictly attended to, and in France particularly, legislation has been resorted to in order "to cover her mountain sides with trees as one of the essential steps in the course of agricultural progress." Our contemporary of the *Revenue Register* points out how much more essential it is to secure and encourage the existence of such a grand agency of humidity and rainfall in the country, where the sun in his glory, and in the absence of counteracting influences, burns and dries up the exposed soil.

It is a fact that wherever forests exist, there water is retained for the benefit of springs, and a great portion of it becomes spread through the atmosphere in the form of vapour. This theory is held by French authorities on the subject and is put forth by the *Madras Revenue Register*, to indicate the beneficial influence by the process on tropical climates. Irrespective therefore of the increase of water-supply, the conservation of forests must affect beneficially the health of the people, by tempering the excessive heat of tropical regions as pointed out above. An experienced officer, who had filled the office of Collector of a district, writes on the subject of forest conservancy in unmistakeable terms. "If the existing woods," he states, "are placed under careful conservancy and suitable measures are adopted to secure in due course reproduction, so that there shall be some wood if possible in every village, we may depend on there being a steady supply of water all the year through in the small rivers which are left at the disposal of private enterprise, and a steady supply in the wells which play so important a part in Indian Agriculture. It is impossible to over-estimate the importance of this question. The cultivation that is carried on from rivers and wells, furnishes a steady employment for labour nearly the whole year round. And wherever this description of cultivation obtains, there a healthy centre is established for the dry cultivation that usually stretches beyond the rice and garden crops. Let the supply of water fail, and the whole scene is changed." It is undoubtedly true that in preserving the forests and in promoting "larger vegetation," we secure uniformity of rainfall and prevent "the disastrous alternatives of sudden floods and prolonged droughts, which are the very ruination of any country." The subject of the conservation of the forests it will be thus perceived, is one of vital importance, and although it has been constantly discussed, we think that it is the duty of the press to bring it before the public from time to time, until the earnest attention of the Government be drawn to it.

It is here necessary for us to point out to the Government of Travancore and Cochin, that the indiscriminate felling of trees in their forests must eventually tell seriously on the agricultural prosperity of the States. While annually large lots of timber are brought down from the forests, and trees are being felled without regard to their age, there is hardly any steps taken to secure reproduction. Forest conservancy in Travancore and Cochin is, as our intelligent correspondent, "SHADE OF THE PERUMALS," would have it, a myth and a delusion. It is a disgrace to the administration of both States that such should be the case, and we hope that a proper system of forestry would soon be initiated by the two officers or by those under whose control the Forest Departments have been placed.—*Cochin Argus.*

TREE PLANTING IN THE PUNJAB.

We give in our correspondence columns, a letter by Lieutenant Pogson, corresponding member A. L. H. Society of India. The valuable suggestions therein made merit the highest consideration, and it is to be hoped, all Civil Military Authorities will pay that attention to the subject which its importance deserves.

What we would desire to draw attention to, is the wilful destruction of the forest trees, such as peepul, banyan, keekur, &c., by the country people cutting off the tender branches for fodder for elephants, camels, goats, &c. Denuding trees of leaves and branches, stunts their growth or destroys them. In the vicinity of our residences two fanneant have taken up their lodgment; the peepul and keekur trees on the spot are nearly entirely bare of upper branches and leaves. We make no doubt, it would be found on enquiry that these vagrants have no right to the trees, and are destroying them for the sake of firewood and fodder, simply because there is no one to hinder them—but it is a question, whether trees in the vicinity of a station or even those in the country can be cut down at the option of the landowner. In Military Stations not a branch can be lopped without sanction.

Surely there must be some conservancy laws, if so, why are they not applied—is it owing to the apathy of somebody who ought to look to it, or what is it? While Government is spending thousands upon thousands on forestry and arboriculture, fine healthy full grown trees are every where being wantonly destroyed, and there is no one to stay the process. Let the Deputy Commissioner or his energetic Assistant ride round the stations some pleasant morning, and note the number of trees in the condition we have described, and he will see that the evil is not an insignificant one.

THE PAGET PARK, UMBALLA.

To the Editor of the Mofussilite.

Dear Sir,—In a recent impression of your journal, you brought to notice, the *Funds* being available, certain improvements in the station of Umballa were in progress, and others were to follow.

The site of the old town "*Bocher-ana*," now called the "*Paget Park*," possesses a very good soil, and is well provided with ancient or "*Badshahee*" wells, some of which have been filled up by order, and others have fallen into dis-repair. Now as want of water, is one of Umballa's greatest wants, I would suggest that all these old wells be cleaned out, and arrangements made for filling them up with rain water, brought to them by suitable cuts being made from the numerous drains, or water-courses of this remarkably well-drained cantonment.

In various parts of Punjab beyond the Sutledje Canal, water is during the winter conducted to old wells, the mouths of which are closed when filled, and when the summer or hot season and winds commence, the water drawn from these wells is found to be not only clear and pure, but deliciously cool as well. These facts show that old dry wells when filled with canal or rain water, may be advantageously made use of as *pucca* reservoirs, whether the water be used for drinking purposes or not.

With a supply of water the "Paget Park," may be made a formidable rival to the beautiful Botanical Gardens of Saharunpore, from whence choice fruit trees suited to the climate might be freely obtained, as also young forest trees, to re-place the very numerous "*Babool*" and "*Keekur*" (*Acacia Fragrans*, and "*Catechu*"), trees with which all our roads and compounds, &c., &c., are freely stocked. The "*Acacia Catechu*," is a short-lived tree, which on acquiring maturity, commences to bleed, and when this discharge of ripe sap is over, the tree dies, its leaves fall, and the trunk and branches await the forester's axe. In a few years all the old *Keekur* trees (none of which are more than 28 years old), will bleed and die off; and arrangements should be made at once for re-placing them, and other small-leaved trees with something better. The researches made by scientific men in Europe and America has satisfactorily demonstrated that trees having large leaves, and *umbrageous foliage*, attract the *rain cloud*, whilst trees whose leaves are small, (and the leaves of the "*Babool*," and "*Keekur*," are the smallest of the small), and the resulting shade nominal, as a rule repel the rain cloud.

This holds good at Umballa, as it very often rains heavily from the Native Cavalry Lines, to the right flank of the Dragoon Lines (where the large-leaved trees terminate), and more or less sparingly in the European Infantry Lines, whilst there is a more optimising in the Native Infantry Lines.

Taking an average, it will be found that there are more large-leaved trees within the "*Paget-Park*" than in the Lines named. If therefore we would extend the rain-drilling bounds, we must plant a suitable number of umbrageous trees, and of these one at every seventy yards is sufficient. The "*Pepul*" (*Ficus Religiosa*), and "*Bunyan*" (*Ficus Bengal*) are both large-leaved umbrageous trees and as branches of from ten to twelve feet of either will take root if properly cut off and suitably prepared for planting, a very trifling sum would be needed (say two annas each) to clothe Umballa with trees so planted.

The *Ficus Elastica* or India rubber tree, grows at Seoni, and at Saharunpore, consequently it will grow at Umballa as well, this variety of the fig may be successfully grafted on the *Ficus Indica*, or banyan, and as the grafted tree so obtained would in due time yield a good supply of marketable *Cheet Chee*, or India rubber, by adopting the suggestion, a considerable income would be derived from this source, and as the leaves of the India rubber tree are much larger than the banyan, (or stock) the increased expanse of foliage, would be a desideratum.

In conclusion, I would wish to mention, that the hill date tree, met with almost half way between *Kalka* and *Dharmsepore*, on the Simla road, and which yields good sweet fruit when ripe, would probaly thrive in the "*Paget Park*" and add greatly to its beauty. I am, Yours faithfully,

FRED. POGSON,

Corresponding Member A. L. H. Society of India.

15th January 1872.

Official Gazette.

BOMBAY, 21st February 1872.

THE MODEL FARM—MADRAS.

Major-General Frederic Cotton to the Under Secretary of State for India, Wrexham, North Wales, 11th November 1871.

Sir,—I beg to acknowledge the receipt of your letter (5309) forwarding two reports on the management of the Sydapett Farm, Madras, and to express my thanks for the opportunity afforded me of reading and remarking upon these interesting papers. Though constantly reading papers on farming affairs from all parts of the world, I have rarely met with any of so great interest as Mr. Robertson's reports on the Madras Government Farms for the years 1869-70 and 1870-71. Mr. Robertson has indeed turned to the best account the means placed at his disposal, and all that he is doing will not only be of extreme value in India, but of high interest to those engaged in farming everywhere. No question arises that is not at once tested by experiment, and as each trial is kept distinctly to the one point under investigation, its results are clear and unquestionable, and, if they are not decisive, it is either because the experiments were of necessity made on too small a scale, or are such as require confirmation from repetition, which we may rest assured they will have. In three years Mr. Robertson has not only brought his farm into order, but he has already shown what important results may be obtained from it, small as it is. By proving the practicability of raising green crops at all seasons of the year, by the introduction of some new plants well suited to that purpose, and by showing clearly the profit to be derived from them, a most important service has been rendered to the country.

His practice of economizing cattle manure, and his suggestions with mineral manures, are of incalculable value, and will eventually lead to the restoration of that vast area of land in India which exhaustive cropping has reduced to a minimum of fertility. The trials which seem to have established the fact that it is only necessary to steep the gram, which hitherto has always been boiled, and is the food of every horse in the south of India, ought to lead at once to the economy of a great amount of fuel, as well as a saving of a very considerable portion of the nutriment in the food. It is extraordinary that this should have escaped detection before, as the other pulse used (Bengal gram) has always been steeped only. This point is of so much importance to the Cavalry that it will of course be thoroughly tested on a large scale. One important result of this change would be the saving of a great deal of good manure, which is now burnt to aid in the boiling of the gram. The introduction of a new breed of sheep will be, no doubt, a success, as with sheep it does not require many generations to establish a new type. This will be a great advantage in the Carnatic, where both mutton and wool are of an inferior quality. And although it is not probable that there will ever be a heavy fleece on any sheep where there is no winter, still the wool may be found to have some useful quality. And I would recommend that, however coarse it may seem, it should be sent from time to time, as it changes its character, to England, for examination, as no one but the manufacturer can determine the value of any material, or can point out what change would improve it. Indeed, in all efforts to effect a change in both animal and vegetable products, the guidance of the consumer should be constantly sought for, as it has frequently been found that the production of a finer appearance has been gained by the sacrifice of some useful quality. Fortunately, in Dr. Forbes Watson, the Government has an able and energetic man, always ready to communicate with the manufacturer, and interest them in a new introduction, so there need be no difficulty now in obtaining their advice. Mr. Robertson's

remarks upon the effects of good and deep cultivation are of great interest, and he is right in pointing out the advisability of manuring, not the surface only, but the whole of the soil stirred by the plough. Indeed, he might have gone farther, and said that the best position for the chief part of the manure is as far below the surface as the roots can reach, for where the soil is richest, there the roots will be most abundant. Manure near the surface is not only wasted by its volatile ingredient being carried off, but its effect on the crop is that the roots are found in the most insecure position, where they can only be saved from withering by a constant succession of rainfalls. In the reports under review, it has been shown that there may have been an abundant, even an excessive, fall of rain, and yet the crops lost by drought. No plant can exist long in its growing season without moisture at its roots, and as the soil dries from the surface downwards, the number of days or weeks, or months a crop can live without rain depends on the depth at which it has its roots. Even in the tropics the soil does not dry to a great extent very rapidly, so that each additional inch in the cultivation adds materially to the security of the harvest; and as that is the most important object that the Agricultural Department will have to work for, Mr. Robertson's experiments on deep cultivation are of extreme value. It was with a view to the trial of deep cultivation over large areas that the steam plough was sent out, and either by its means, or by some common subsoil plough, I hope its good effect may yet be shown on a scale that shall leave no doubt of its efficacy to reduce materially the risk of scarcity and famine; and as in land under ordinary good tillage the yield is almost in proportion to the depth of cultivation, and an acre ploughed to a double depth will save the farmer nearly a whole acre's rent, the profit will be so immediate, that even the poorest ryot may afford to purchase this better security without reducing the acreage of his farm. Interesting as all Mr. Robertson's experiments are, I will not be tempted to comment upon them further. If my observations can be of any value, it will be by pointing out what I consider the deficiencies of the farm, and the means I would adopt to supply them. I must, however, while congratulating the Government on the present hopeful state of agricultural affairs in Madras, remind those writers on the subject who are inclined to underrate every effort made before the appointment of Mr. Robertson, that the most important step was taken by Sir William Denison when he established the farm; and, judging from the pace at which agricultural improvements move in England, the Government has gained as much advantage by the very small sum of money spent from first to last, as could under the circumstances be anticipated. I have before warned the Government that, although the Sydapett Farm was doing such good service, it is not fit for its purpose either in area or position, and I must reiterate my advice that another site should at once be selected. The extent of the farm is even now insufficient for the trial of the preliminary experiments in progress. Farming on the scale of gardening, however interesting and suggestive, is altogether delusive when made the basis from which to calculate farm profits. No one with any experience in farming would be satisfied when told that a 6 ft. of plot of land had produced 60 lbs. of cotton, and therefore he might reckon on 1,000 lbs. on every acre. The weights and measures of arithmetic may be ever so carefully treated, but the multiplication of a slight error has too often led to disappointment for any practical farmer to consider a small experiment trustworthy. The Government trials must be on a scale large enough to be conspicuous and convincing, and the list of subjects touched upon in their account of the infant farm at Sydapett, can hardly give the faintest idea of the multitude of questions that will have to be investigated. The Farm Committee have declared, that the Sydapett soil is too light for it ever to become a good seed farm, which is rather a serious fault; and they give up all hope of breeding cattle from the want of suitable land for the purpose. In short it must be admitted, that there is not extent of land or variety of soil that fits it to become the central farm for the Presidency. Nor is the want of space the only defect of the present site. The absence of a stream of water for irrigation is a still more radical fault, as it prohibits entirely the examination of the most important of all questions,—the value of water, and how it can best be economized.

I have seen lately, in the estimates for completing the great irrigation works, that every calculation is based on the supposition that rice and rice only, is to be grown on all the land that can be watered. Is this advisable? I have, in a former paper, pointed out that irrigated rice is only grown where land is taxed, and the water is given by Government in unlimited quantity. But where water is raised from wells, at the cost of the cultivator, it is rarely or never grown, other crops being cultivated which yield a better return for the cost of the water. In India the water is the property of the Government, and on it depends not only the prosperity of the country but the lives of its inhabitants, it behoves the Government therefore to guard it as its most precious treasure. It will no doubt be the first object of the new Agricultural Department to determine how this invaluable gift can be best economized, and to ascertain this, its actual value on every crop must be tested by experiment. In these all-important investigations, the Sydapett Farm, with its able Superintendent, can give no help whatever. Nor can the pupils educated there carry into the provinces any knowledge of the treatment of land under irrigation. I cannot but think that the Government will agree with me as to the advisability of correcting this; and that permission will be given for a farm being begun where there will be land enough, and water enough, to make their experimental farm and place of agricultural tuition complete.

I am glad that His Grace the Secretary of State has given me an opportunity of calling attention to this subject now, while the Sydapett Farm is in a condition to be disposed of, without probably any loss to the Government. That it is in that condition is due to the good management of the Committee, and the rigid economy of their Superintendent, who, if I read the accounts rightly, has built a very considerable homestead and a residence for himself for less than 500*l.*, about one-seventh of the estimated cost of the smallest station, or shed, as it might have been, on the projected narrow gauge railway in the Valley of the Indus. I must be allowed to express a hope that this cheap engineering may not be lost sight of by the Agricultural Department,—a warning, as it appears, not unnecessary in the present day. I have always considered the Sydapett Farm well placed in being near the seat of Government, and I would not that the farm I propose should be far from Madras. In the Carnatic, it is true, it cannot have the advantage of the most certain irrigation, because that can only be had under the influence of one of the great rivers that rise in the Western Ghauts, and receive their supply from the south-west monsoon. The next source of supply within moderate distance of the Presidency will be found under a large tank supplied by the Palaur river; and Caverypauk, which is about 60 miles from Madras, is the finest of these works. If a channel could be led from this on a high level to command a strip of land on the edge of the present irrigation, it would have every advantage of position, being within moderate distance of the railway, and having any extent of dry land available for unirrigated cropping, or for cattle and sheep breeding.

If the farm were in such a position as this, the Superintendent would have so good an opportunity of gaining information as to the result of the native mode of working the wet land, that he need not himself go largely into rice cultivation. And working with the ryots as his immediate neighbours, he would be able to give them advice; and there would be a far better chance of having his improvements in agriculture adopted than he could hope for in Sydapett. Now that the Government has taken under its supervision the agriculture of the country, I hope an effort will be made to convince the native cultivators that it will be well for them to break through their present system of doing everything in their own houses, and leave all that can be done better and more cheaply for them to those who make it a special business. It was with a view to this that many of the implements supplied at Sir William Denison's request were sent by me to Madras. If these could be brought into use, as it was my hope they would, for the benefit of a whole village, the ryots would all have the advantage of aid from machinery, although their capital was insufficient for the purchase of it.

I can remember when the travelling threshing machine, worked by cattle, first came into use in England, and the system has now been extended, till not only is all the threshing of the small farms done by itinerant machines, but the steam plough, the cider-mill, the corn-drill, and other implements, are all to be hired when wanted. As there has hitherto been no one to move in this matter, much of the machinery sent out by me and others seems to have been unused, and its lying idle has always been attributed to the poor ryots not being able to purchase it, which it was never supposed they could. The Farm Committee has had no power of doing anything in this matter, it was out of their province; but I hope something now may be done, and I would repeat a suggestion made when I first sent out the chaff-cutters, that one or more, with a horse or bullock gear to work them, should be set up at one of the halting places near Madras, where straw is purchased every night for some hundreds—it may be thousands—of bullocks: and it would be a great saving to the consumer if he could purchase it cut by the machine. I should imagine that some one could be found to undertake this, if the apparatus were given to him for the trial; and if he succeeded, the value of the machinery would be money well spent by the Government. I have no knowledge of some of the machinery still in store, as it was not sent out by me; but I can hardly imagine any English agricultural apparatus not being applicable to some good purpose in India, where the rudest mills, worked by cattle, are employed to advantage. And I strongly recommend, instead of abandoning it, that every effort be made to bring it into use in such a way that it could be employed on hire. As for the Government loss, if the implements were given to those who would make the first attempt to introduce the system, the whole sum spent from first to last is so small compared with the object to be gained, that it need not be taken into consideration. Before closing my remarks, I would express a hope that this farm, transferred, as I propose, to a better site and developed to the utmost, may become a place of instruction for agricultural teachers of every class, and I would endorse the suggestion of Mr. William Robinson, in his admirable Minute on the agricultural scheme for the Madras Presidency, that agriculture should not only be taught on the Government farm, but that it should be recognised as a science worthy of a Professorship in the Madras University.

SEASON REPORTS, JANUARY 1872.

GENERAL REMARKS.—If we transect the Continent of India by east and west lines, running—one through the great Central mountain ranges above Nagpore, and the other through the high table-land between the Godavery and the Kistna rivers,—we shall find each of the three divisions presenting a uniform and distinct phase in the subjoined Returns.

In the northern-most, including the Punjab, N. W. Provinces, Oudh, and the greater part of Bengal, the weather has been damp or showery, and the spring-crops generally give fair promise, though in places especially in Oudh and the N. W. Provinces, they have been injured by rain, hail, or blight. To the extreme east the weather has been drier, and the prospects are uniformly good.

In the Central division, which comprises a portion of the Central Provinces, the Berars, parts of Chota Nagpore, and Cuttack, and the two northern districts of the Madras Presidency, there continues a marked, though not as yet severe, drought, felt most apparently in the districts of Ganjam and Vizagapatam.

In the southern division, that is, in Mysore and the remaining districts of the Madras Presidency, the weather has been dry, and the agricultural prospects are almost universally favourable.

No report has been received from Bombay and Rajpootana.

Presidency or Province.	District.	Date of District Report.	Rain fall in last eight preceding	Date of report from Local Government or Administration.	State of agricultural prospects.	Remarks of Local Government or Administration.
Madras	Ganjam	January 31	Nil	February 1	Water supply diminishing, well-sinking in progress; market well supplied, grain imports large; prices high, but not rising, health good.	In the Northern Circars the effects of drought are more marked as the season advances. The markets are well supplied by imports. Relief works have been started in Ganjam. Elsewhere prospects are fairly good.
	Vizagapatam	" 31	Nil	"	Drinking water diminishing, market well supplied, prices unchanged, health good.	
	Godavery	" 29	Nil	"	Market well supplied, prices steady, health good.	
	Kistna	" 31	Nil	"	Markets well supplied, prices steady; harvest fair; prospect fair.	
	Kurnool	" 31	Nil	"	Markets well supplied, prices steady; crops fair; health good.	
	Nagapatam	" 31	1·25	"	Prices falling, prospects good.	
	Trichinopoly	" 31	Nil	"	Prices steady, crops fair, harvest below average.	
	Coimbatore	" 31	Nil	"	Prices low and steady, harvest fair, prospects good, health good.	
Bengal	Bhagulpore Division—					
	Monghyr		1·1	January 31	Weather seasonable, crops very good; rain very beneficial.	
	Bhagulpore		1			
	Sonthal Pergunnahs				Light showers in Rajmahal and Goddah; mustard being reaped, cold weather crops want more rain.	
	Patna Division					
	Patna		1·8			
	Sarun		1·5		Spring crops in Tirhoot, Gya and Chumparun are [illegible] in the other districts slightly injured by rain; [illegible] threaten to produce blight in them.	
	Shahabad		1·6			
	Tirhoot		1·8			
	Chumparun		Slight			
	Gya					
	Rajshahye Division				Light showers in Dinagepore and Malda, crops good everywhere.	
	Burdwan Division				Weather fair and good, prospects of winter crops favourable; in Burdwan they are not doing well for want of rain.	
	Presidency Division				Weather seasonable, crops good, except in Nuddea, where they are not good.	
	Dacca Division		Nil		Crops good.	
	Chittagong Division				Weather fair, crops good, in Chittagong outturn unusually good.	
	Cuttack Division		Nil		Cold weather crops good except in Pooree, where they are suffering from want of rain.	
	Chota Nagpore Division				Weather fine, crops good, in Manbhoom, suffering from want of rain.	
	Assam Division				Weather dry and cold, most crops gathered; outturn good.	
	Cooch Behar Division				Some rain at Julpigoree and Darjeeling, crops good, most gathered.	

Presidency or Province.	District	Date of District Report.	Rain-fall for fortnight preceding.	Date of report from Local Government or Administration.	State of agricultural prospects.	Remarks of Local Government or Administration.
N. W. Provinces	Allahabad	.....	1·	February 1	Spring crops excellent.	
	Benares	.....	1·4	"	No serious damage; wheat and barley mildewed in some low-lying lands.	
	Meerut	.....	2·4	"	Prospects good; hail fell in Haupper Tehseel, and did much local damage.	
	Agra	.....	1·	"	Rape crop injured by fog and storms; wheat and gram not much damaged.	
	Bareilly	.....	1·1	"	No harm done as yet.	
Punjab	Delhi	.....	0·6	"	Weather cloudy; state of crops good.	Rain fell pretty generally during past fortnight; agricultural prospects good.
	Umballa	.....	0·2	"	Agricultural prospects good.	
	Jullundhur	.....	0·1	"	Rain highly beneficial to crops.	
	Lahore	.....	0·2	"	State of crops good: hail on 29th, but no damage reported.	
	Mooltan	.....	Nil	"	Crops as reported before.	
	Rawul Pindee	.....	2·	"	Agricultural prospects excellent.	
	Peshawur	.....	0·7	"	Agricultural prospects good.	
Oudh		.....	...	"	The rain has proved unfavourable to the rubbee, and considerable damage is to be feared; gram and mustard crops have been injured in some places by insects.	
Central Provinces	Raipore	January 27	Nil	"	Rubbee crops have suffered in parts from want of rain. The late dews have done good, and prospects on the whole better than heretofore.	
	Belaspore	"	Nil	"	Crops progressing favourably, except *Alsi* somewhat injured by cloudy weather.	
	Sumbulpore	"	Nil	"	Prospects unchanged.	
	Jabbulpore	" 31	27	"	Prospects of rubbee good throughout division. In Saugor pulse crop slightly suffered from excessive frost.	
	Hoshungabad	"	Nil	"	No rain, and prospects consequently not so good as before. Baitool same, not favourable. Less area sown. Blight on wheat has appeared.	
	Nursingpore	.....	...	"	Rubbee in two Tehseels particularly promising; in third not so good	
	Nagpore	" 31	Nil	"	Khurreef all out. Rubbee crops have suffered from occasional cloudy weather; wheat not so promising as last year. Prices stationary. In Wurdah no rain. Prospects of crops moderately fair.	
Hyderabad Assigned Districts	East Berar	.....	...	"	No improvement since last report. Rubbee crops still in backward condition. Partial failure in some parts of the division anticipated. Rain urgently required.	
	West Berar	" 30	...	"	No improvement in the prospect of spring harvest. In many parts a total failure of crops.	Weather cloudy and warm; a change in the season now would do no good to the crop. It would improve the water-supply which is fast failing, and with the scarcity of fodder is causing serious distress and an increase of cattle sickness.
Central India	Indore	" 31	...	"	No change since last report.	
	Gwalior	" "	·32	"	.....	
	Baghelkund	"	1·3	"	Crops generally promising; slight fall of hail on 24th.	
British Burmah	.....	.....	at Bassein. Nil	"	Rice crops reaped.	
Mysore	Bangalore	February 1	Nil	"	Most of the crops have been harvested; their condition is favourable.	Agricultural prospects continue favourable.
	Mysore	January 30	Nil	"	Most of the crops harvested; cotton, sugar-cane, &c., thriving.	
	Coorg	" 31	Nil	"	Paddy being threshed; dry crops thriving. Bengal gram being reaped. Picking and despatching of coffee still continued.	

RECLAMATION OF "OOSUR" OR "KULLUR" SOIL IN THE PROVINCE OF SINDH.

Memorandum by COLONEL W. L. MERRYWEATHER, *Commissioner in Sindh, on the papers forwarded under endorsement of the Deputy Secretary to Government of India, Public Works Department, 19th August 1871.*

THE land called "oosur" in the North-West Provinces is styled "kullur" in Sindh, and is very largely met with throughout the Province. Salts are present more or less thoughout the soil, and in some places to such an extent that vegetation cannot exist. These are, of course, easily distinguishable, and are generally of a deep brown colour, and after rain become greatly slippery, quite impassable for camels and difficult for horses. In other places there is no perceptible sign, but on the first use of fresh-water saline effervescence follows injuring attempted crops. This was, I believe, the case on land first watered by the Jumna Canal, and caused great alarm amongst the land-holders. All of this kind of soil is however found capable of reclamation. The time, trouble, and expense being only in proportion to the extent and quality of the salt prevailing. When the salt is not excessive, the process is both speedy and simple. A crop is sown in spite of the saline appearance. It of course is only poor, but whatever is produced, excepting any heads of grain, which are cut off, is left on ground, ploughed afterwards and allowed to decompose. With the next rise of the River Indus the water spread over the ground gives a film of good soil, which is also ploughed in, and improvement is markedly manifest; the second crop being very much superior to the first, and so on until the soil is fit for any crop. Observing this, a similar process was tried in proposed garden ground, where clear well water was used, and gave good results. Plain stalks of jowaree were chopped up, and a top dressing of good soil added. These having been ploughed, the plot was watered, and then afterwards replough'd; where before little or nothing would grow, cereals, vegetables, and flowers flourished excellently. Vegetable manure would assist well in this process, but care should be taken how manure obtained from towns or villages is used, as in that case the very substance desired to be removed or neutralised may be added to.

The Planters' Gazette.

BOMBAY, 21ST FEBRUARY 1872.

THE ESTATES.

THE Coffee-market is steadily recovering from the effects of the Franco-German war. The *Ceylon Times* points out how steady and continuous has been the rise in the price of fine Middling Plantation Coffee during the last twelve months. From 78s. 6d. in January 1870 the price fell to 63s. upon the outbreak of the war. The quotations at the beginning of last year were 66s. 6d. and the course of the market since has been as follows:—

1871.	s.	d.		s.	d.
January	66	6	to	66	6
February	66	0	"	71	6
March	64	0	"	69	6
April	63	0	"	69	0
May	63	6	"	69	6
June	62	0	"	68	6
July	65	6	"	71	0
August	65	0	"	71	0
September	70	0	"	75	6
October	70	6	"	76	0
November	72	6	"	77	6
December	73	0	"	78	6

The short crop in Brazil has been the cause no doubt of the recent rise, which is likely to be maintained. The House papers tell us that "the export deliveries in November were nearly equal to those of 1870, and the total for eleven months continues to exhibit an increase of 13,266 tons, and as the imports were about 2,300 tons relatively smaller, the deficiency in stock at the end of the month was increased to 4,855 tons."

IPECACUANHA.

Mr. McIvor of the Government Cinchona plantations at Ootacamund, reporting to the Commissioner of the Nilgiris, under date November 9th, says:—

"I have the honour to inform you that the plants of Ipecacuanha, planted in the Burliar garden in May last, are making very extraordinary growth, and that the climate seems well suited for the production of this valuable medicine. I trust therefore that a portion of the plants now being forwarded to India by the Secretary of State may be sent here for trial, as probably they may be grown more successfully in the neighbourhood of Burliar on the Nilgiris than in the north of Bengal.

"The natural locality of the Ipecacuanha is strictly tropical, and the great difference of temperature of summer and winter caused by higher latitudes may possibly affect the growth of the plant.

"The Government of Madras have therefore applied to the Government of India for a few additional plants for the Ootacamund Plantations."—*Indian Statesman.*

CINCHONA.

Mr. McIvor, the Superintendent Government Cinchona Plantations, has submitted to Government a comparison of the growth of Cinchona plants in British Sikkim and on the Neilgherries. He finds that on the Neilgherries four years growth of *Cinchona Succirubra* exceeds that of the same species in British Sikkim by 3 feet 10 inches in height and 7 inches in circumference of stem, or three times the bark-producing surface. When the greater thickness of bark of the Neilgherry plants is taken into consideration, the yield may be estimated at about four times the quantity of bark produced during the same period of growth by plants of this species in Sikkim.—*Madras Mail.*

CINCHONA BARK.

(To the Editor of the Pioneer.)

SIR,—"C. R." who gives a "nut to crack" in your issue of the 4th instant, is a little in error when he states Cinchona bark was not introduced into Europe till five years after Oliver Cromwell's death, as it is a well-known fact that the Countess del Chinchon, wife of the Viceroy of Peru, imported the bark into Europe in 1638, about 10 years before Cromwell's death, and in after years, some Jesuit missionaries distributed it among several of their converts throughout the stations in Spain and Italy. It then fell much into disuse through being employed by quacks without due discrimination. The bark was introduced into England by Sir R. Talbot in 1671, or 13 years after Cromwell's death, when a pound of the bark sold at 100 louis-d'or, or about Rs. 800. What effect it might have had if Cromwell had sent to the continent for quinine is hard to conjecture; and it is also doubtful whether the "Pulvis Comitissae" of those days in the hands of empirics would have cured one of the greatest of England's rulers of that dire disease.

ROYALIST.

Letter from the Resident in Travancore and Cochin to the Secretary to Government, Revenue Department, Fort St. George, dated Quilon, 6th November 1871.

I HAVE the honour to enclose copy of a letter to my address from the Conservator of Forests, pointing out that an enormous percentage of the Cinchona trees in the Travancore Government plantations of Peermede are dying out apparently from canker. Major Beddome suggests that, if possible, the services of Mr. McIvor should be obtained to visit the plantations, "as the visit could not fail to be interesting and instructive to that officer," who might also be able to give some valuable advice. The Travancore Government have incurred a good deal of expense in connection with the plantations without much prospect of direct return. It would be glad if Mr. McIvor could be spared to visit the place, and would be prepared to pay his travelling expenses between Coimbatore and Peermede and back, if Government is pleased to direct an inspection, which may, besides benefiting the plantation in question, throw some light on the important subject of Cinchona culture generally.

From Major R. H. Beddome, Conservator of Forests, to the Resident of Travancore, Trevandrum, dated Ootacamund, 10th October 1871.

LAST month, when passing through Peermede, I visited the Cinchona plantation belonging to your Government under the charge of Mr. Sinclair, and I was astonished to find an enormous percentage of the trees dying out; in fact, I believe, all that have flowered are dying, both the trunk and branches seemed suffering from canker; and from Mr. Broughton's description of the disease on the trees at the Darjeeling plantations, I believe the trees at Peermede are affected in exactly the same way. The soil at the Peermede plantation is very good, and the sub-soil is fair, though much laterite is present in the latter. I brought a piece of this laterite up to Mr. Broughton, and he thinks it can be in no way the cause of the disease. The primary cause is probably excessive moisture at a low elevation, and the epidemic once appearing, of course its spread is very rapid in a plantation of all the same trees. It would be advisable, I think to cut out every diseased tree, both with the object of stopping the epidemic and of getting the bark off before it deteriorates; but I would certainly advise your Government to

obtain the services of Mr. McIvor, if possible, to inspect the plantation, and give his advice, and the visit could not fail to be both interesting and instructive to that officer. I was glad to see that trees were being planted out here and there amongst the indigenous trees in the Sholas, and I think it is very probable that these trees will escape the disease.

From the Superintendent Circar Garden, Peermede, to the British Resident of Travancore and Cochin, &c., &c., &c., dated Maryville, 21st October 1871.

I BEG to state that out of the 3,192 *Cinchona Succirubra* trees, averaging from 5 to 20 feet in height, there are not more than two-thirds of them in a healthy state. I have examined the roots of some of the dying trees, and they appear all healthy enough. The only place the disease appears to attack them is close to the ground, and works upwards. The bark gets quite dry and destitute of sap. What it really can be owing to I am at a loss to know, unless it is what I stated to the Dewan, excessive moisture and rock together. I find that the Cinchona, from the second to the fourth year, grows very rapid, and keeps a healthy robust appearance; but after that time the growth generally becomes slow, and a sickly yellow appearance sets in. I also find that any of the *Cinchona Succiruba* that shows any sign of flowering or seeding always die out. The remaining five varieties, I may say, are in no way affected. I am at present getting the bark off as quick as possible from the dying trees; but if it is the case that Mr. McIvor will visit the Cinchona garden here, I would propose that the dying trees should be left so as he can see the general state of the plantation, and he will be better able to form an opinion what really is the cause of the trees dying out.

TEA.

THE special correspondent of the *Indian Daily News* with the Chittagong column of the Lushai Expedition, mentions in his letter, that on the line of march from the Towrong Klang North, tea, growing wild, is to be found. He has sent us a specimen leaf, which, on examination, appears to be somewhat longer and narrower than the leaf of the ordinary cultivated plant as seen in Assam. The specimen however has the serrated edge of the tea plant, and there can be no doubt about the correctness of our correspondent's conclusion that the leaf forwarded is of the tea species, and that the tea plant is indigenous in the locality indicated.—*Indian Statesman.*

FROM an English paper we extract the following paragraph on the chemistry of tea:—

"Zoeller, in Liebig's "Annalen," shows that the *age* of tea-leaves may be determined by the analysis of the ash. Young leaves, of which all the best teas consist, contain large amounts of potash and phosphoric acid, of which constituents the older leaves are comparatively deficient, while they become richer with age in lime and silica. In the practical examination of tea, therefore, there is a very simple guide. Much potash and phosphoric acid, with little lime and silica, indicate good tea; the reverse, bad tea. The ash of a sample of young tea grown in the Himalayas amounted to 5·63, grains per cent., and it contained in 100 parts 39·22 of potash, 4·24 of lime 4·38 of oxide of iron, 4·35 of silica, and 14·56 of phosphoric acid On these data, the analysis of the ash may also be employed to detect the adulteration of tea with spent or exhausted leaves. From the same sample of tea 4·94 per cent. of theine was obtained, and 13·7 of proteine compounds."—*Indian Statesman.*

THE following remarks on the tea districts of Assam are taken from the *Indian Observer*:—

"Active enquiry is, we hear, being made in Assam and the north-eastern tea districts generally as to the condition of the waste lands granted under the leasehold rules. Government is, it is said, determined to resume in all cases where the stipulations as to clearing and reclamation have not been carried out. There have undoubtedly been great abuses under these rules. Large tracts of country were taken up by land jobbers who have neither had the capital nor the intention to cultivate them. There can indeed be little doubt that during the 'tea mania' land was recklessly given away in every direction. Even the local officers were carried away by the excitement, each thinking to develop his district into a new Goshen. If anyone can remedy this state of things so late in the day, Mr. Campbell is the man. We see so much well-directed energy in his revenue administration of Assam, that we are disposed to regret the severance of that province from Bengal just as the Lieutenant-Governor's policy regarding it is taking shape. At the same time we trust that in dealing with the question, Mr. Campbell will take care that no injury is done to *bona fide* planters. The tea interest is just recovering from the crisis of 1866, and promises to be as profitable a branch of industry as any the country possesses. We should be sorry to see its progress checked in anyway by a want of liberality on the part of Government. There exists somewhere, we understand, a valuable paper on the revenue system of Assam, drawn up by Mr. Campbell when on tour last rains. Will he not make it public?"

TEA CULTIVATION.

A BOMBAY newspaper says:—Here is good news for Punjab tea-planters. Letters have been received at Cabul (so says a correspondent) from Turkistan by merchants, stating that the Punjab hill tea had been found so far superior to China tea in Bokhara that people had ceased using the latter; the price of the former had consequently risen very considerably. The Cabul merchants had therefore instructed their agents to buy up all the hill tea that could be procured at Umritsur.—*Colombo Observer.*

THE TEA-TRADE OF FORMOSA.

THE island of Formosa bears unmistakable evidence of a volcanic origin. This is particularly noticeable in the northern portion, where there are many extinct volcanoes, the steep sides of which are favourite spots for tea-planting. In many places the Chinese have, with great patience and skill, levelled the rugged masses of lava and formed terraces, which they keep covered with earth brought in small baskets, on men's heads, from the plains. The tea-trade of Formosa is entirely confined to the northern ports, and nearly all the tea grown in this island is exported to the United States or Australia. With the exception of very poor people, the inhabitants use an imported article, brought from Poo-chou-foo. They give no reason for this, beyond "that they have always done so," from which it may be inferred that custom, more than the superior quality of the Chinese tea, has caused them to overlook their own article.—*Frank Leslie's Illustrated Newspaper.*

HIMALAYA TEA.

(BY T. ZOELLER.)

THE May number of the *Annalen der Chemie* and *Pharmacie* contains the result of an interesting investigation on Himalaya Tea, by Th. Zoeller, which is of considerable value.

The author begins by stating that the opinion that the different sorts of tea are derived from various species of the tea-plant had been refuted by Siebold, and more completely still by Fortune's inquiries. Black and green tea are both derived from *Thea sinensis*, and the many varieties of tea in the trade are not products of different plants, but merely results of differences in climate, soil, cultivation, and in the preparation of the leaves, but, above all, of age. Although the tea-plant itself is hardy enough to bear considerable fluctuations in temperature, still the quality of the leaves greatly depends upon the soil, cultivation, and, as stated just now, upon the age, while their preparation has no effect upon the quality, but only alters the outward form. Zoeller had previously shown that with beech-leaves the composition of the ash constantly changes with the age of development in the leaves, inasmuch as the amount of potash and phosphoric acid gradually decreases with progressing age, while lime and silica constantly increase in quantity. Taking this observation as his basis, Zoeller concludes that if the quality of tea is in the inverse ratio to the age of the leaves, the analyses of the ashes of it must enable us to determine the age, and consequently the quality. A high percentage of potash and phosphoric acid with little lime would indicate a young tea, or a superior quality; while, on the other hand, much lime and little potash would be the characteristics of an inferior quality. The author succeeded in obtaining some samples of Himalaya tea, collected when very young, and the analysis quite bore out his anticipation. These leaves had been gathered very early, the lanceolate form was not quite developed, they were of a fine black colour, and produced with hot water the most delicate aroma.

The analysis gave 4·95 per cent. of water, and 5·63 per cent. of ashes, containing much potash and phosphoric acid, and little lime, boiling water extracted 30·20 per cent., of which 4·91 per cent. was theine. To separate the alkaloid, the cells of the leaves were completely broken up by maceration with concentrated sulphuric acid; the acid was then neutralized by moist hydrated oxide of lead, and the mass repeatedly extracted with alcohol: the alcoholic extract was treated with animal charcoal, and after filtration slowly evaporated, when most of the theine separated in shining silky needles.

Further evaporation did not yield any more crystals, because the sugar formed by the action of sulphuric acid upon cellulose interfered, and made the solution too syrupy; the rest of the theine was therefore separated by ether. The alcoholic extract on standing over-night deposited crystals, which Liebig took for theobromine; although the minuteness of the quantity prevented exact determination, the observation is important, as the presence of theobromine in tea had not before been shown. The nitrogen in the tea leaves amounted to 5·38 per cent.

The complete analyses of the different constituents showed the following results, viz :—

	Ash of tea leaves.	Ash of aqueous extract.	Ash of leaves after extraction.
Potash	30·22	53·13	7·34
Soda	0·65	0·68	0·69
Manganese	9·47	3·13	11·35
Lime	4·24	0·95	10·76
Oxide of Iron	4·36	1·73	9·63
Oxide of Manganese	1·09	0·43	1·07
Chlorine	0·67	0·37	traces
Phosphoric Acid	14·65	7·89	23·41
Sulphuric Acid	traces	traces	traces
Silica	4·55	2·62	7·57
Carbonic Acid, &c.	34·30	26·30	25·28
	100·00	100·00	100·00

Percentage of Nitrogen.	Air-dry leaves.	Dry extract.	Exhausted and dried leaves.
Nitrogen	5·28 p. c.	10·69 p. c.	3·48 p. c.
Ash	5·63 „	11·46 „	3·00 „

100 parts of ashes of the leaves are composed of 30·82 parts of ashes of the exhausted leaves, and 69·18 parts of ashes of the extract.

The results lead to the conclusion that Himalaya tea is quite equal to the best Chinese tea, but it must remain undecided whether the presence of theobromine is accidental, or constitutes a distinction : the results also bear out the experience of tea-planters, that the youngest leaves of the tea plant give the best quality.

In the determination of the age of the leaves by analyses of the ashes, the amount of potash must always be compared with that of phosphoric acid and lime, because the older plants often show a high percentage of potash if grown on soil rich in potash salt, but the amount of lime and phosphoric acid invariably decreases according to the age.

Remarkable and characteristic of the ashes of tea is the large quantity of iron and manganese. The effect of iron in the infusion of tea upon the vital functions has been noticed by Liebig in his Chemical Letters, and the importance of iron in vegetable life is well known, whereas that of manganese has not yet been ascertained.

In making infusions of various samples, they show a difference, inasmuch as the best tea was most readily exhausted. The component parts of the ashes are dissolved in different proportions ; chlorine almost entirely, potash very considerably, lime, magnesia and phosphoric acid, but slightly. The different solubility affords a ready means to distinguish exhausted leaves from not exhausted ones ; and this may be of practical importance, as exhausted tea is often made up and brought again into the trade. The ashes of exhausted leaves contain but little potash, but much of the above-named insoluble substances.

In reference to the action of tea upon the human system, the author again points to the richness in potash, the importance of which in nutrition has been demonstrated by Kemmerich's experiments. But as the infusion of tea contains but little phosphoric acid the alkali is enabled to convert the acid phosphates of our food into less acid ones, *i. e.*, into those which act as solvents of insoluble albumen, and which form part of the normal conditions of blood.

Hot water dissolves 3·50 per cent. of nitrogen ; tea contains 4·04 per cent. of theine, equal to 1·73 per cent. of nitrogen ; the difference in nitrogen, namely 2·14 per cent. is, according to Peligot, part of caseine, and corresponds to 13·7 per cent. of caseine, a quantity sufficiently large to play an important part in the process of nutrition.—*Pharmaceutical Journal and Transactions.*

COFFEE.

A PLANTING correspondent, writing from the vicinity of Kandy, takes an unnecessarily gloom view of Coffee prospects at the present moment; he says :—"Leaf disease is very bad, and the next three months will open our eyes as to what the future of old estates is to be. To anyone about to invest in Coffee, I should give Punch's advice to those about to marry."—*Ceylon Times.*

A PLANTING correspondent, dating the 20th June from this district, says :—Here as elsewhere crops, I am sorry to say, turn out short of even our very moderate estimates. As a rule estates are well on in work and in capital order, with perhaps one or two exceptions easily accounted for. I hear one of our oldest, indeed I may say the oldest planter in the district, has discovered that the leaf disease is beginning to shew itself in the bean. We are all anxiously awaiting the onward progress of the rail from Peradenia, and if, as is said, the contractor will enable us to get our crops away from Gampola by the end of this year, we will vote him a jolly good fellow. Weather fine and quite in favour of the forthcoming blossom, for which we shall soon be looking.—*Ceylon Times.*

CAPE COFFEE.

ACCORDING to Natal advices, the coffee crop in that country was estimated at 1,000 tons. Planters are said to be full of hopes in the future, and were convinced that, "with careful cultivation and prudent choice of locality, the enterprise was remunerative as well as an easy and pleasant one." Very likely, but let them wait until they get the leaf disease amongst their properties !—*Ceylon Times.*

LEAF DISEASE.

DEAR SIR,—As anything relating to our new pest, "Leaf Disease," must be interesting to you, I will tell you what I really saw of it in Dimbooln The places up here do not look so badly, but then there are crops! Leaf disease too where it has appeared is very bad, and not only is the type of it seen here as elsewhere, but it also takes another form ; the leaf not spotted but half of it burnt clean through, as though scorched.

The young places seem all that one could wish, but the old hands are becoming anxious about future supply of labour, more especially as not only is a large tract of land coming into bearing within a year or so, but the land to be planted up will alone demand a large increase in the force of coolies. Do you know the altitude of some of the last lots of land sold was as much as 6,000 feet : this on our side is far too high for Coffee, even if Jack Frost does not have something to say to them.—*Ceylon Times.*

January 15th. TRAVELLER.

COFFEE CURING.

HOWEVER strange it may appear under the circumstances of unusually short crops, it is nevertheless the case that during the present season Parchment Coffee has been received in Colombo in a much wetter state than in any previous year. The extra cost of curing under such circumstances is felt by preparers very materially, we know of Parchment having in many cases been exposed on the barbecue in Colombo for seven days before it could be placed under the peeler, a state of things which certainly could not have improved the quality of the parcels in question. Coffee Curers in Colombo have frequently the greatest difficulty in preserving parchment from damage during cloudy weather in the early months of crop season, by reason of the large quantities of wet coffee hurried down to them and which rapidly accumulates in their stores.

If managers of estates would in the matter of despatch, act more in concert with their Colombo Agent, it would be to the advantage of all parties : they may, and no doubt are, often put to some inconvenience in wet districts, by the accumulation of uncured parchment in their estate stores, but they will not mend matters if they hasten their Coffee to Colombo Stores, already choked with parchment in a similar condition, besides which they should remember how much extra Railway freight they pay by sending down Coffee containing a large percentage of water.—*Ceylon Times.*

THE *Bangalore Spectator* remarks :—Surely no cultivation was ever so tormenting as coffee planting. It is not long since the bug was looked upon as the *fons et origo mali* to the coffee plants, and everybody was up in arms to get rid of the pest. Now the coffee leaf disease has started up and will probably drive some coffee planters frantic. The worst of it is that no one seems to know the cause of it. Drought has been assigned as the cause, but in places where there has been rain enough, acres have been troubled with it. When some very hot weather set in the attacked leaves dropped off, leaving no sign of the disease. This has been corroborated with reference to another district which had suffered severely from wet weather, and the trees gradually improved as the dry weather succeeded. One planter has suggested that it is caused by the extensive use of artificial manure, and especially by *lime dust* : the fields manured with this having caught it first and suffered most, part of the estate did not suffer at all. In flat opposition to this theory another writer says that estates which have never had any manure applied to them have suffered severely. Manuring *per se* could never originate the disease, though it might be introduced through the medium of manure. The disease is said to be a well-marked fungus, and not a mere degeneration of the tissues of the coffee tree. It is an independent growth, deriving its sustenance from the juices of the coffee tree. It is widely propagated by means of its spores, which are light enough to be carried long distances by the wind. From this it is difficult to suggest any remedy for stopping the pest. As the spores are fed upon by the larva of a species of fly, it is thought that it may tend to destroy the spores as fast as they are produced. Nothing is known of the way in which the coffee was first infested, but it is supposed that it affected some of the indigenous plants, and thence found its way into the cultivated coffee. Perhaps the best way is to be particular as to the vigour of the young plants, and the seeds. This seems to be the only barrier available against the blighting effects of this fungus. It is a pity too that planters should be thus tantalized at a time when coffee prospects are brightening.

A CORRESPONDENT of the *Madras Mail* writes :—"The cultivation of coffee has already proved so ruinous to many of those who wished to open up the resources of this Presidency for their own and their country's good, that an invasion of a fresh enemy and drawback may well-nigh be its *coup de grace*. What is the '*leaf-disease*,' what causes it, and what is effectual in banishing it from an estate! The result of it is, that trees affected by it have not a leaf on them, and all the young wood dies. The disease is supposed (a mere conjecture) to have been brought on by the late unusually long monsoon. It appears as a tiny black speck on the back of the leaf, and by evening pervades the whole leaf, which turns *black* and drops from the tree during the night. When examined under a microscope, it seems to be a kind of black fungus. Is this the last of the cheerful trio of B's—bug, borer, and blight—that one's friends talk so glibly about *after* one has invested savings, the sweat of one's brow, in coffee. I think it must be. Leaf-disease! Nothing was said about it in the prospectus of our company, though intending shareholders were assured that this estate was peculiarly favoured in having escaped both bug and borer. The shares were issued at 100 rupees each, and fell at once on a rumour of '*bug*' to 35, but the shareholders, re-assured by a 'bumper-crop,' treated it as a *hum*. In the following year, the *borer* made some havoc in the estate, and shares fell to 25 and 26; while this year, with the *blight*, and nothing but leafless sticks visible as far as the eye can reach, shares are quoted at 5 rupees, with no buyers, in the open market. A few have been saleable at this price to some speculative natives, but to induce them to allow the transfer to their names, it has been necessary for the seller to make them an advance of Rs. 4-15-6 in cash. As a shareholder I, of course, was able to procure a sample of last year's crop, and wishing to satisfy myself as to the quality of our brand, I gave a small parcel to my boy with particular instructions not to roast it black but to *brown* it nicely. Imagine my horror, in reply to my enquiry, if it was ready, when my boy informed me—'Done Brown, Sar!' Was he laughing at my board? Did *he* too know the name of our company? Every tale should have its moral. The moral of this little episode, in the life of one hasting to be rich, is *stick to government paper, if only at 4 per cent.* Distrust all schemes which offer 10, 15, or 20 per cent. on the venture, and turn a deaf ear at the outset to those which prophecy smooth things, even to 50 per cent.',

MR. TYTLER'S THEORIES OF CYCLES, &C.

(*Ceylon Observer.*)

DEAR SIR,—I have a great respect for Mr. Tytler's opinion on most subjects, but in this one of "wet cycles" and "seasons out of joint" he may be somewhat mistaken. For instance he says "that when we have dry cycles, human and other animal life prospers, whereas at that time, vegetable life is exposed to disease, &c., whereas, when there are good crops, with vegetation healthy, and everything seed-bearing we find for animal life * * all the ills human life is subject to." The years 1866 and 1867 were particularly *dry* years in Ceylon, and both Natives and Europeans suffered a great deal from fever and other complaints, the natives particularly so. In wet seasons it is generally understood the country is healthier, I have heard old planters say that the climate used to be much wetter 15 or 20 years ago than it is now, or has been for sometime back. If it was so much wetter before the planting period the climate must have been almost unendurable. As to leeches, if Mr. Tytler will come up to Dimboola we will give him leeches to his heart's content in the jungles, but as the coffee is generally so clean very few will be found there. Leech-gaiters are as essential in the forests of Dimboola as they ever were, to those who are afraid of being bitten. I have seen a few of our planters suffering from these bites at the present time. The reason why the leeches have disappeared, is doubtless because there is no place for them to conceal themselves in the coffee, now that estates are kept so much cleaner than formerly, and the heavy jungle having all been cut down in the neighbourhood of the older districts. As for land-slips after heavy rain, was there not one on the railway recently? And they may be seen in the roads up-country, though not to the same extent, simply because the road-makers are more careful in back-sloping and back-draining.

India has been in a chronic state of famine from the earliest times, and probably will be again, unless wise laws and the spread of education enlighten the natives as to the benefits to be derived from the construction of tanks and irrigation works.

The coffee tree does not send its roots so deep into the ground as to require such terrific deluges of rain as Mr. Tytler anticipates are coming upon us, rain that would tear and rip up the ground to a depth far below what is required for the sustenance and life of a small coffee tree. Sea Captains' ideas with regard to Ceylon are that it is an Island blessed with very gentle showers, and I remember rather surprising one by telling him of the heavy rains we sometimes have in the interior. So soon as ships get as far south as Galle, they think their troubles over. Lieut. Maury's theory of the monsoons, if I recollect rightly, not having the book by me, is that the immense deserts in the interior of Asia get heated up, causing an immense vacuum, towards which the vapour clouds on the north side of the equator are attracted, causing the south-west monsoon. This vacuum being filled, the cold air again rushes back towards the equator, causing in turn the north-east monsoon. This theory is sustained by the fact that the south-west monsoon begins far to the north first, and works its way downwards, not, as many suppose, rising in the neighbourhood of the equator, and working its way upwards. The quantity of rain that falls here may depend upon the greater or lesser quantity that may have descended before it reaches Ceylon, and hence perhaps the variableness of our south-west monsoon rains.

The oldest districts of the Island have had their day, and done good service, and it is scarcely fair to lay the blame on the clerk of the weather, if they wont continue to give good crops, even although the trees are crammed from root to branch with Sombreorum. We must just trust to Him who says that while the earth remaineth seed-time and harvest shall not cease.—Yours truly.

S. S. W.

9th December 1871.

PRIZES FOR COFFEE.

A CORRESPONDENT writes as follows:—"The well-meaning Committee of the Agri-Horticultural Society have again offered a prize for the best sample of coffee, the produce of the Madras Presidency, or of Mysore, Coorg, Travancore, or Cochin. Now I do think this is altogether a mistake. What possible good do the Committee expect to follow. It is right on the part of the Government to offer every resonable and proper encouragement to so important an industry as coffee planting, but this industry has advanced far beyond the stage at which a prize such as is now offered can be of any benefit. The Committee invite competition from planters in every different climate and circumstance embraced by the extensive country stretching from Gopalpore to Cape Comorin. The difference in the quality of the coffee produced in the various districts are well known, and it is absurd and futile at this time of day to ask the owner of a low-lying estate, say in Wynaad, to send his coffee to compete with the produce of the high lands of Mysore. In the infancy of coffee cultivation some good might have resulted from bringing together the coffees from all different coffee-growing districts in the country, and affording planters an opportunity of making comparisons under the stimulus of a prize for excellence; but it is useless at this time of day to offer such inducements. If the Committee persist in giving the prize is, I believe most people who know what coffee planting is will agree with me that the prize will be altogether thrown away. I would suggest to the Committee and the Government that if they really wish to reward a coffee-planter for merit in the exercise of his calling, they should depute a person of experience to visit the coffee estates throughout the country, examine into the mode of working, and all the details of the cultivation, and the after-processes of curing, &c., and empower him to present a prize to the Manager who is found to have his estate in the best order, who manages his coolies best, makes the most of the money entrusted to him for working, has the largest yield with reference to locality, and the best coffee. I may also suggest to the Government that something may be done to encourage coffee-planting and increase the revenue, if the ambassador I have proposed should have the power also of presenting a prize to the Public Works Department for a road in the coffee districts properly looked after, a bridge properly constructed and creditably maintained in a passable condition, and a police or other public building fit for the purpose it was constructed for. The prize offered should be large. Far better for the Government to look to the proper and efficient expenditure of the public money in the communications through the coffee district, than to throw however little of it away on this Agri-Horticultural prize.

"Tea-growing is still in the experimental stage in this Presidency, and the prize offered for it is not open to any strong objection; but I shall be glad to know what good is to be done by the prizes for Western Guntoor, Coimbatore, and Tinnevelly cotton and Indigo. They are possibly new products to the Agri-Horticultural Committee, but I trust I shall not surprise these worthy gentlemen too much by assuring them that they have been long known to the traders of this Presidency, who have some better encouragement for obtaining good quality than this prize."

THE FUNGUS ON THE COFFEE-TREES.

(*Ceylon Observer.*)

THE following is an extract from a letter of Mr. Thwaites, of Peradeniya, to a correspondent:—'I wish people who publish that the coffee-leaf disease is attacking other plants would send me specimens. They are doubtless deceived by appearances not well investigated. I have not yet been able to detect the identical disease upon any other plant but coffee—not even on *Ixora*. I thought I had found it on *Pavetta Indica* a few days ago, but my pocket microscope had proved it to be quite another thing, though in general appearance very like. The wild assertions some people make would be amusing if they were not more or less misleading

and [illegible]—We are indebted to a planting correspondent [illegible] affected with the disease, [illegible] made by Mr. Cooke and Dr. [illegible] to us as contributors to the 'Food [illegible] with Dr. Muter of the South London [illegible] and Pharmacy, I examined the leaves by his [illegible] with a low (1 inch) power. The blight re[illegible] a granulated deposit on parts of the surface. A higher [illegible] of fungoid growths, having a yellow[illegible] tint. I afterwards scraped off a portion of the blight on [illegible] moistened it with a drop of distilled water, covered it with a thin glass disk, and subjected the object to the ⅛th inch power, the highest in practical use. The appearance presented was [illegible] cells, having serrated edges of a greenish, [illegible] tint. At the first examination, Dr. Muter suggested that [illegible] to be the pollen wafted from some parasitic plant, and adhering to the coffee leaves, had undergone fermentation on them. After discussing the subject thoroughly, we agreed that from whatever source derived, the blight was a true fungoid growth. It might be well to ascertain therefore, whether or not there is any extensive waste land adjoining the coffee plantations producing weeds having a greenish, yellowish flower; to watch what wind was likely to carry the pollen in the direction of the coffee-plant; then to interpose a barrier of bamboo, cocoanut or other coppice, so as to interrupt the flight of the minute organism, if the waste land cannot be reclaimed.—William Cochran, M. B. A. S.—3rd Nov. 1873.'

CEYLON COFFEE SOILS.

The following results were obtained in the analyses of these soils, by Dr. Augustus Voelcker, F.R.S., Consulting Chemist to the Royal Agricultural Society of England.

Loole Condera W. M. L. L. C. 3.

100 parts of this soil, dried previous to analysis at 212° Fr. in order to expel all accidental water, and to admit of comparison with the composition of other soils, which were all dried at 212° before the analysis, contained:—

Organic matter (loss on heating to redness)	12·01
Oxide of iron	9·29
Alumina	9·04
Sulphate of lime	·17
Carbonate of lime	1·38
Magnesia	·62
Phosphoric acid	·30
Potash	·27
Soda	·17
Insoluble siliceous matter	67·45
	100·00

This is a rich, dark-coloured coffee-soil, very superior to the majority of Ceylon coffee-soils, which have been brought under my notice from time to time.

It is rich in organic matter and contains appreciably more phosphoric acid than most soils on which coffee is grown.

I have no doubt it will maintain its fertility for a succession of years without manure, but would recommend an occasional manuring with a view of preserving and possibly increasing its fertility, rather than to exhaust it by continual cropping without manure.

On this soil poonac, especially castor-oil poonac, which is greatly more valuable as a manure than cocoanut poonac will be of the greatest use to the coffee trees, and I would recommend the use of castor-oil poonac on this soil, in preference to all other manures as likely to yield the most profitable return.

W. M. L.

Loole Condera L. C. 5.

100 parts of this soil dried at 212° Fr. contains:—

Organic matter	9·18
Oxide of iron	10·55
Alumina	9·40
Sulphate of lime	·08
Carbonate of lime	·37
Magnesia	·37
Phosphoric acid	·08
Potash	·04
Soda	·07
Insoluble siliceous matter	71·03
	100·00

Although this soil has the appearance of a good coffee-soil, the preceding analysis shows that it is extremely poor in all the more important mineral elements which enter into the composition of coffee. It will be noticed particularly that it contains [illegible] of phosphoric acid and [illegible] potash and soda. It contains [illegible] organic matter and [illegible] of lime, and [illegible] dark colour [illegible] appearance. This probably is due to the nature of the soil-[illegible], which probably is not well drained.

I do not find anything decidedly injurious in this soil, and can well understand that the trees do not grow satisfactorily and yield a poor crop, for of all mineral constituents of coffee, phosphoric acid and potash are by far the most important, and the soil contains scarcely any of these valuable fertilizing matters.

The contrast, in the composition of the soils No. 3 and No. 5, is very striking to anyone who understands what intimate relation there is between the stores of phosphoric acid and potash in the soil, and the healthy development of the trees which are grown upon it.

The amount of phosphoric acid in good soils seldom exceeds ·20 per cent., and hence ·30 as the percentage of this acid in the soil No. 3, has to be regarded as unusually high, and that in No. 5 soil as very small and altogether insufficient to meet the requirements of the coffee trees. The same remark applies to the deficiency of potash in No. 5.

Unless this soil is heavily manured with matters abounding in phosphate of lime and potash, it will never grow good coffee. Before incurring the expense of applying bone-manure in conjunction with potash-salts, fertilizers which naturally suggest themselves for increasing the fertility of soil No. 5, I would suggest to stir up the sub-soil without however bringing any to the surface, and mainly with the view of improving the drainage of the surface soil and admitting the air more freely into it.

Loole Condera Soils marked Nos. 1, 2, 3½, and 4.

Only partial analyses were made of these 4 soils, chiefly with a view of comparing the relative proportion of organic matter in them.

The following are the results of this examination:—

	W.M.L. L. C. 1.	W.M.L. L. C. 2.	W.M.L. L. C. 3½.	W.M.L. L. C. 4.
Organic matter	10·20	11·21	7·23	6·93
Oxides of iron and alumina	12·13	11·63	10·88	20·61
Carbonate and sulphate of lime	·81	·12	·83	None
Magnesia and Alumina	1·14	·04	·34	·17
Insoluble siliceous matter.....	75·62	77·41	79·00	70·29
	100·00	100·00	100·00	100·00

No. 1, as far as I can judge, is likely to be a good coffee soil.

No. 2 contains rather more organic matter than No. 1, and a great deal more than No. 3½ and No. 4 and No. 5, but not so much as No. 3.

Although rich soils contain frequently much organic matter, there is not necessarily a close and invariable connection between the amount of organic matter in different soils, and their relative fertility. Indeed some soils which do not contain more than 5 per cent. of organic matter, but which abound in essential mineral plant constituents, I have found to yield good crops. Such soils generally have a bright red colour. Dark-coloured soils, when poor in organic matter invariably are infertile. On the other hand, if the dark colour is due to the presence of organic matter, as in newly-cleared and burnt land, the soil is productive.

No. 4, it will be seen, contains no lime, and probably is much exhausted by frequent croppings.

For the more or less exhausted Loole Condera soils, I would recommend the following artificial manure, which I have found in practice to answer remarkably well.

20	parts of muriate of potash, containing 50 per cent. pure muriate of potash
20	„ of fine bone-dust.
40	„ of superphosphate of lime, containing 20 per cent. of soluble phosphate
20	„ of sulphate of ammonia
100	

About 5 cwts. of this manure will be a good dressing per acre.

The preceding mixture is best prepared in England by any well-known large manufacturer of artificial manures. It can be made for about £10 a ton, and is far superior to any of the special coffee manures which are sold in the colonies at much higher price. In giving an order for the manufacture of the preceding artificial manure, I would recommend that a fairly drawn sample from the bulk, taken by an independent person, should be sent to me for analysis, in order that the purchaser may be assured that he obtains the constituents which enter into the compositions of this manure and the right proportions, and that he obtains the full value for the money he has to pay for the manure.

Naranghewa Soil marked W. M. L. No. 2.

This soil dried at 212° has the following composition:—

Organic matter	6·66
Oxide of iron	7·10
Alumina	5·80
Sulphate of lime	·11
Carbonate of lime	·66
Magnesia	·16
Phosphoric acid	·08
Potash	·44
Soda	·02
Insoluble siliceous matter	77·92
	100·00

This soil is not a bad coffee-soil, but it is somewhat exhausted in phosphoric acid. The preceding artificial manure will suit it remarkably well, and 5 cwts. per acre, I have little doubt, will not only maintain it in good condition, but will raise materially the produce, and the increase in the crop will pay for the outlay in manure.

Instead of 5 cwts. of the preceding manures, 3 cwts. of it mixed with 4 to 5 cwts. of poonac might be tried by way of comparison.

As a rule, I do not recommend saltpetre as a manure for coffee trees, for the effects of saltpetre are very evanescent, and in a wet season the saltpetre is rapidly washed out of the soil.

Potash, which is generally defined in Ceylon coffee-soil, is much better supplied in muriate of potash than in nitrate of potash (saltpetre) which latter moreover is a more expensive salt than muriate of potash.

Bullatwelle Soil, No. 1.

100 parts of this soil dried at 212° Fr., contains:—

Organic matter	9·34
Oxide of iron	12·64
Alumina	16·47
Sulphate of lime	·47
Magnesia	·75
Phosphoric acid	·07
Potash	·28
Soda	·23
Insoluble siliceous matter	59·57
	100·00

It will be noticed that this soil is poor in phosphoric acid and in potash. It contains no carbonate of lime, and abounds in alumina and oxide of iron.

Coffee trees like a free-growing soil. The Bullatwelle soil No. 1, appears to be too retentive, and probably is a cold and wet soil. Perhaps it is not well drained. The surface of this soil should be well stirred.

A good manure for this soil is the following mixture:—

20 parts of muriate of potash.
20 „ of fine bone-dust.
30 „ of superphosphate.
15 „ of nitrate of soda.
15 „ of sulphate of ammonia
100

4 to 5 cwts. per acre.

Moratenne Soils, No. 1 & No 2.

The following is the composition of these two soils, dried at 212° Fr.:—

	No. 1.	No. 2.
Organic matter	7·03	13·13
Oxide of iron	10·05	6·67
Alumina	15·44	6.01
Sulphate of lime	·30	·04
Carbonate of lime	None	·35
Magnesia	·27	·71
Phosphoric acid	·10	·25
Potash	·12	·15
Soda	·03	·12
Insoluble siliceous matter	66·66	72·27
	100·00	100·00

No. 1 differs greatly in composition from No. 2.

It is much richer in oxide of iron and alumina, constituents of no special value than No. 2.

On the other hand it is much poorer in organic matter than No. 2, and also in phosphoric acid and potash.

No. 2 likewise contains more lime than No. 1, and altogether No. 2 is still fertile, although rather poor in potash, whereas No. 1 is evidently an exhausted soil which, however, may be greatly improved by appropriate manures.

The following artificial manure will be found serviceable for, reclaiming the fertility of No. 1 soil.

25 parts of muriate of potash.
25 „ of fine-bone dust.
33 „ of superphosphate of lime.
15 „ of sulphate of ammonia.
100

9 cwts. per acre should be applied to the land

For No. 2 soil Moratenne, I would recommend 4 cwts. per acre of the following mixture:—

20 parts of muriate of potash.
20 „ of fine bone-dust.
40 „ of superphosphate.
20 „ of sulphate of ammonia.

Pendleton Soil No. 3.

This soil dried at 212° has the following composition:—

Organic matter	8·07
Oxide of iron	2·64
Alumina	7·66
Sulphate of lime	·17
Carbonate of lime	1·01
Magnesia	·65
Phosphoric acid	·08
Potash	·10
Soda	·08
Insoluble siliceous matter	80·23
	100·00

It will be seen that this soil contains hardly any phosphoric acid, and not much organic matter. It appears to be [illegible] thoroughly of its phosphoric acid, and hence phosphatic manure in conjunction with organic manure should be applied. I would recommend for this soil an artificial manure composed of:—

25 parts of muriate of potash.
25 „ of bone-dust.
35 „ of superphosphate.
15 „ of sulphate of ammonia.
5 cwts per acre mixed with 4 cwts. of castor-oil poonac.

Gona Adika Soil No. 14.

This soil contains in 100 parts, when dried at 212° Fr.:—

Organic matter	[illegible]
Oxide of iron	[illegible]
Alumina	[illegible]
Sulphate of lime	·11
Carbonate of lime	·49
Magnesia	·22
Phosphoric acid	·06
Potash	·28
Soda	·03
Insoluble siliceous matter	[illegible]
	100·00

This soil is poor in phosphoric acid but otherwise a good coffee-soil. It should be manured with bone manures.

The following artificial manure will suit this and similar land on the estate well:—

35 parts of fine bone-dust.
35 „ of superphosphate of lime
15 „ of muriate of potash.
15 „ of sulphate of ammonia.
100

5 cwts. per acre.

Speaking generally nearly all Ceylon coffee-soils are much improved by phosphoric manures, combined with salts of potash and a moderate amount of sulphate of ammonia. Much however depends on the relative proportions in which these matters are applied to the land. The composition and character of the soils must regulate the composition of the manure best suited for a particular soil.

MARKET REPORT.

LONDON, 18th January 1872.

TEA.—The deliveries in London, estimated for the week, were 3,019,997lbs., which is an increase of 171,499lbs. compared with the previous statement.

SUGAR.—The market is steady for medium and lower qualities, at previous prices, good and fine dull of sale. 187 casks British West India sold: Jamaica, 32s. 6d., Demerara, 30s. 6d. to 33s. 40 casks Demerara melado, at 24s.; and 6,000 bags Mauritius, brown to low yellow, 29s. 6d. to 31s. 6d.; a small part fine crystallised 37s. 6d. 3,200 bags Mauritius were offered by auction, and mostly sold; low gray syrupy, 31s.; fine grainy brown, 32s. 6d. Refined dull of sale, but prices are supported, owing to the small supply offering for sale.

COFFEE.—The market generally is less buoyant. At the auction previous prices were about maintained, although the parcels offered went off slowly. 300 casks 60 bags Plantation Ceylon chiefly sold: triage, 5s., 66s. 6d. to 71s.; small triage middling 74s. to 77s.; middling to bold, 78s. 6d. to 80s. 6d.; peaberry, 84s. 6d. to 89s. 650 bags Native Ceylon chiefly sold: good ordinary, 69s. 6d. to 70s.; fine bold 72s. to 72s. 6d: peaberry, 73s. 210 cases, 70 bags Coorg sold: triage 67s. to 68s. 6d.; ordinary to fine ordinary, pale 72s. 6d. to 74s. 200 cases Kaitchoomam: triage and ordinary, 70s. to 72s. 6d.; low middling and middling, 75s. to 77s.; bold, 83s. 6d. to 85s. 100 packages Mocha—ordinary green, 67s. 6d to 68s. 130 bags damaged from Mauritius, 66s. 6d. to 67s. 160 bags Guatemala, pale, 66s. 6d. to 67s.; and a small part of 1,300 bags washed Rio—good ordinary 72s.; middling, 73s. 100 bags Honduras bought in at 71s.—*Home News.*

CALCUTTA, 2nd February 1872.

INDIGO.—One Public Sale has been held during the week, comprising 143 chests, which consisted for the most part of lots which had been previously brought in at former sales and rejected parcels so that there is but little alteration in the quantity disposed of, the quantity sold up to date being very little more than 91,000 maunds. There is still a little European to come forward, as there are about 200 chests of the Gale mark, which are not expected to arrive for a few days, on the arrival of which the season will close. There is no alteration to note in prices, which continue to be irregular. It is probable that [illegible] 71-72 will total 94,000 maunds.

INDIAN SILK.—Public Sales held during the week comprised [illegible] of which 1,307 chests were sold and the remainder withdrawn; a portion of the latter however were disposed of privately after the sale. The [illegible] were not of very desirable quality, and prices obtained were about on a par with late rates.

BENGAL SILK.—Some 20 bales of last year's [illegible] and [illegible] Silks, speculators' hands about that time have recently [illegible] with this exception the entire remains in the [illegible] for months past. The November [illegible] available, but buyers and sellers appear to [illegible] offered are fully equal to the requirements of [illegible] known to be [illegible]. The heavy [illegible] almost entirely damped the confidence of shippers in the article.—*Bengal Chronicle.*

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

VOL. III.] BOMBAY, THURSDAY, 21ST MARCH 1872. No. 8.]

Agricultural Gazette of India.

CONTENTS.

NOTICES TO CORRESPONDENTS

Will you tell me the best method of laying out a Lucerne garden, as I am expecting to needing watering &c?

Much will depend upon the area of land you intend to put under this crop, and the nature of your soil but the following general instructions may be useful

If the ground is under natural grass, or is covered with surface weeds, you may plough or dig it slightly (2 or 3 inches), then harrow or rake the grass, &c., together into lines, cart this to some convenient corner of the field, and burn the whole to a black ash, keep these ashes until the land is ready for seeding, and then spread them carefully over the surface After paring and burning, or if the land is already under arable cultivation, plough or dig deeply, and harrow or rake the surface fine, to offer every facility for the germination of all weed seeds, and as these appear above ground, repeat the ploughing or digging 3 or 4 times Then plough or dig in about 20 loads per acre of good farm-yard manure. Harrow or rake the surface, and roll heavily; then spread broad cast over each acre 20 cwts of lime powder and the ashes before alluded to, and harrow or rake in lightly Then sow about 20 lbs of seed per acre, in rows 12 inches apart Keep the space between the rows clean with the hand hoe, &c., *are carefully to this, for, if well-weeded during the first year, the after expense of weeding will be greatly lessened* After the first year, or after the crop is fairly established, you may greatly reduce the cost of weeding, by using a light bullock hoe between the rows. Always cut the crop *before* the flower appears. Under good management the crop will last 9 or 10 years, and yield regular and abundant crops; but you must manure liberally, always bearing in mind that lime and potash manures are of the greatest value for Lucerne. So far we have alluded to Lucerne—under dry cultivation—in a district with a favourable climate. If you wish to grow the crop—under irrigation—you may, after cleaning the land, ridge it up with the plough or spade as is done in turnip cultivation in Scotland the ridges may be 12 inches high from the bottom of the drill, and 15 inches apart from centre to centre. In the drill between ridges spread manure at the rate of 20 loads per acre; then split the ridges with a plough or spade, throwing one-half on either side, thus raising the new ridges over the manure, and making furrows or drills where the ridges stood; sow the seed on the ridges, and the water will flow down the furrows between. Just time at the rate of 20 cwts per acre, and the ashes over the land. Roll or harrow the ridges carefully, and sow the seed at the rate of 20 lbs. per acre; do not sow deeper than 1 inch; and chain harrow, or rake the surface lightly afterwards to cover it. We have replied to you at this length, believing that some of our readers who keep horses or cattle, may be induced to try a plot of this valuable plant

1 MARCH.

I wish to use the refuse of a slaughterhouse as manure how shall I proceed?

We presume that you refer to the solid and liquid refuse if so, in our opinion, the best and cheapest plan is to make the whole into a compost Dig 2 or 3 large receptacles, the size being regulated by the amount of refuse at your disposal Over the floor of one of these, lay 1 foot of ashes, leaves saw-dust peat, or anything of the sort, and spread over this the daily supply of refuse matters taking care to cover each addition to the heap with a covering of 3 or 4 inches in depth of ashes, continue this daily adding layer after layer until the heap has reached the surface of the ground, then cover the whole with a foot of peaty earth and commence a fresh heap in a similar manner Each heap may remain 3 months unopened after which it will be difficult to detect its ingredients indeed we have seen cute coolies working amongst composts of this sort without offering the least objection. It will be well to get a light iron sewage cart for conveying the liquid and solid matters to the depot such a cart, should not cost more than 200 Rs

What is a fine crop of Maize in this country?

About 2,000 lbs of grain and 5,000 lbs of straw

What price would I pay for a good thorough bred short-horn Bull in England?

You may purchase an ordinary animal at from 50 to 100 guineas but high pedigree animals command prices varying from 500 to 1,000 guineas

LETTERS TO THE EDITOR.

To the Editor of the Agricultural Gazette of India

SIR The ducks sold all over this presidency are divided into two classes known as Goa ducks and Desi or country ducks and the former though smaller are more valued than the latter The Goa ducks are with few and rare exceptions of a plain grey brown colour, whereas the others have more or less black and white upon them and are often distinguishable by blue secondary wing feathers and a metallic green lustre on their heads There is also a marked difference in the shapes of the two breds Can any naturalist tell me the history of the two varieties? A B C

MR LOGINS EXPERIMENTS.

To the Editor of the Indian Statesman

SIR I regret to observe in your issue of the 20th instant that you think that "the Model Farm at Cawnpore is not suitable for the growth of cotton, as the result was a qualified failure "though superior "care was given to the choice of ground and manure, and to the details "of cultivation This above conclusion arrived at is I think premature, for at the 10th para of Mr Parson's report, he says — By August 7th, the greater portion of the plants were 5 feet in height, and "were then topped, which induced them to throw out several branches," and in the next para he continues to say — The plants began to bloom August 15th but owing to the heavy rains during that and the following month the produce of these flowers was very inferior, owing to "the attacks of the boll worm"

The fact is, the plants were not healthy after the beginning of August but up to the 7th they had grown exceedingly well as the "greater portion of the plants were 5 feet in height" and had commenced to "throw out branches" So up to this time all was flourishing As a rule however as the heavy rain began to fall, the plants failed so the question is why this failure? And I think the cause is given in the 2nd to 7th paras of this report For at para 2nd Mr Parson says the site of the experiments is situated on the north-east side of the farm and is *sheltered by tall trees on the west, south and south east*, and at para 7th he continues to say "Plot 1st consisting of a quarter acre, was treated as recommended by Mr Login Ridges 1 inch in height were thrown up at intervals at 3 feet"

Now the above at once explains to me how the experiment proved a failure, for as I have already more than once reported, all shade from trees is studiously to be avoided for the cotton plant is a *sun plant* and requires light, so in this case the field was surrounded by *tall trees on*

three sides, only being open to the north. The fact is, therefore, that the field, being only a quarter of an acre, must have been always in shade, the very thing to be guarded against.

Again, the ridges were only *four inches* in height when they should have been *eight inches* high at least, and I believe that even ten or twelve inches, in localities liable to flooding, would be better. I certainly tried eight inches, but then particular care was taken of the drainage; thus the water could never reach to the top of the ridge, so as to come in direct contact with the plant. To this, in my report of October 1870, I drew particular attention, and at considerable length tried to assign a cause why the plants were injured, by stagnant water coming in direct contact with the stem of the plant; but be these reasons correct or not, there can be no doubt of the fact that the cotton plant is very seriously injured, and in many cases killed, by water coming in direct contact with the stem, of which I had convincing proofs both this and last season.

In Egypt the ridges are eight inches high, but it should be borne in mind that it is almost a rainless country, and there everything depends on irrigation; thus they can so arrange that the water can never be more than 4 or 5 inches deep between those ridges leaving 3 or 4 inches of these ridges above water, so it can never come in direct contact with the plants, and hence the wonderful out-turn of cotton in Egypt compared with India. So all the greater need of even higher ridges in this country, where we often have excessive rain, and also the necessity of attending to the drainage of our fields, so as to prevent these being flooded.

To me therefore it appears self-evident that excessive *shade* and excess of *water* have been the sole causes of the failure of the cotton experiments at Cawnpore, which is very much to be regretted, for in other respects a considerable amount of care appears [illegible] been bestowed on the experiments; so I hope these essential points will be attended to next season wherever the Egyptian system of growing cotton is tried, and as you take a great interest in this important question, I hope you will find space at an early date for the insertion of this letter.—I remain, dear sir, yours truly,

T. LOGIN.

MINERAL AND SALINE MANURES.—III.

To the Editor of the
Agricultural Gazette of India.

According to the analysis of *Erdmann*, the ashes of wheat, after deducting per oxide of iron (1·33 per cent.), silica and sand 3·37 per cent.), contain of,—

Free phosphoric acid	27·09
Alkaline phosphates	19·18
Earthy phosphates	23·13
	100·00

Phosphoric acid, in combination with soda and potash, constitute the alkaline phosphates, and when united to lime and magnesia, the earthy phosphates, all these are invariably present in the blood of man and beast.

The redness of blood in red corpuscles is intimately connected with its richness in iron, and as recent analysis has demonstrated that the blood of the Hindoostanee is, as compared with the blood of the European, deficient in red corpuscles, it is evident that the degeneration is due to the deficiency of iron, and as a sequitur, everything else corresponds. The difference in strength, bone, and muscle between the two races requires neither comparison nor comment, though it excites contemptuous commiseration.

The most interesting part of the matter is that no artificial addition of suitable preparations of iron to the food will act beneficially on the blood, unless the alkaline phosphates are fully and sufficiently present. Baron Liebig informs us that "the free alkali" gives to the blood a number of very remarkable properties. By its means the chief constituents of the blood are kept in the fluid state. On the alkali depends a remarkable property of the blood,—that of dissolving the oxides of iron, which are ingredients of the colouring matter of the blood, as well as other metallic oxides, so as to form perfectly transparent solutions. All organised solid parts contain alkaline bases and phosporic acid, in such a proportion, that if we suppose them combined, the phosphoric acid predominates." Further on the learned Professor states:—"The phosphate of soda has an alkaline taste and reaction, like the carbonate and its solution, in presence of free carbonic acid, takes up as much of that acid as the carbonate of soda does, and like it, only more easily, gives it off by agitation with air, *in vacuo* or by evaporation, without losing its power of again absorbing the carbonic acid." Liebig's letters, page 408—412.

The phosphate of potash converts common salt into the phosphate of soda. If it be deficient, and the supply of salt low, the alkaline strength of the blood is reduced, and with it the power of dissolving iron: hence the white blood corpuscles predominate in consequence of the want of iron, and I presume the inferior quality of the blood, produces the constitutional weakness and want of stamina of the people of Hindoostan.

Man and beast alike require phosphoric acid, and derive it from the plant,—"which is so wonderfully formed, that it refuses to grow, unless it can obtain the phosphoric acid, &c., which it is bound to gather up and supply to the growing animal."

This phosphoric acid is indestructible; we operate upon bones and fossil phosphate of lime which contain it, and produce phosphorous. We set fire to 100 lbs of it, and lo, in place of obtaining a small quantity of ash, we gather 227¼ pounds of phosphoric acid, which in the dry state consists of about 43½ per cent. of phosphorous and 53½ of oxygen. This acid dissolves very freely in water, and it combines with lime in the proportion of 51½ of acid, and 48½ of lime. Soda, when saturated with its solution, forms pure phosphate of soda, and the carbonate of potash similarly treated forms the phosphate of potash, which is the principal mineral matter present in the flesh of man and animals.

The Mogul Government, when in power, knew nothing of these matters, and perhaps considered the act of stinting millions of human beings, in their consumption of salt, a harmless one. We cannot blame them, for England during the last century groaned under salt laws, and salt taxation, which however were abandoned as soon as the common sense of the nation, so ably represented in the British Parliament, was convinced that neither fish, meat, nor curds, could be salted, nor soap nor glass be cheaply manufactured, nor an improved system of agriculture be introduced and maintained, if culinary salt was looked on as a luxurious condiment, and taxed accordingly.

The Indian convict is allowed one hundred grains of salt per diem, and if an honest man uses 180 grains of salt daily, he will consume 4 *seers* and 9 *chittacks* in the year, the value of which at two annas (three pence at par) per *seer*, is eight annas and nine *pies* (0.1*s* 1½*d*). But if this man's acre of wheat land was manured with a bushel, or 30½ seers of salt, obtainable for agricultural purposes, at a cost of fifteen annas and-a-half (1*s*. 11½*d*), and his salt as condiment, supplied for two annas, his salt bill would amount to Rs. 1-14-8, in place of 8 as. 9 pies, or just double. But this is not all, inasmuch every additional acre of land manured with salt, increases its consumption by 30½ seers or [illegible] sixty [illegible] pounds, and brings a corresponding sum of money into the Exchequer.

It is by no means necessary that the rock salt of the Punjab, or imported British salt, should be used as manure, as crude or unrefined sea salt is better fitted for the purpose, and so is the salt eliminated from saltpetre. One thousand parts of sea water contain 5·3 sulphate of magnesia, 3·5 chloride of magnesium, 0·2 carbonate of lime and magnesia, 0·1 sulphate of lime, besides 1:2000 of sulphate and muriate of potash, and in addition, iodide of sodium and magnesium in smaller proportions. These various substances are present in sea water with 25 of chloride of sodium or salt.

All grain contains a certain proportion of magnesia, and wheat more than any, and as crude salt contains a considerable percentage of magnesian salts, its value, as a wheat manure, is apparent.

I think it is quite possible to render all crude sea and earth salt totally unfit for culinary purposes, by imbuing every hundred pounds of such salt with five pounds of sulphate of iron, in aqueous solution.

The British manufacturer could prepare such feruginous salt at a very low rate, and in India, to pay for this sulphate, a duty of five annas per maund should be levied on saltpetre, which should be paid by the purchaser, the Government receiving the duty, and supplying the saltpetre manufacturer with the sulphate of iron. By this means, cheap salt would become plentifully available for agricultural purposes, and all restrictions being removed from the manufacture of nitre, that most important manure would be freely used by agriculturists, desirous of producing first-class wheat, tobacco, and sugar crops.

It is quite unnecessary to go further into the question of the value of salt as a manure, but it will interest the reader to know that the Chinese, the best and most ancient agriculturists in the world, have from the remotest times used salt and sea water as a manure.

M. le Gonx, in his history of the cocoanut tree states that the inhabitants of those parts of China which border on the sea coast, sprinkle their rice fields with sea water, and use no other manure; and that in the interior they sprinkle the lands with salt before they are tilled, and that this practice has been followed for ages with the greatest advantage.

The quantity of salt to be used varies from one to six bushels per acre, pasture lands requiring most. I may mention that as much as 2½ cwts of salt have very recently been applied to an acre of land under potatoes; but this profusion is quite unnecessary. Before proceeding to the next manure, I would wish to state authoritatively that salt is as much needed by all graminiverous animals as by man.

If proper inquiry were made, it would be found that want of salt is at the bottom of the various cattle diseases for which India is becoming so famous. We hear constantly of butchers' meat being unfit for use, because horrible living things were present therein. On this subject, Professor Johnstan states:—"From time immemorial it has been known that without salt man would miserably perish; and among horrible punishments entailing certain death, that of feeding culprits on saltless food is said to have prevailed in barbarous times. Maggots and corruption are spoken of by ancient writers as the distressing symptoms which saltless food engenders, but no ancient or *unchemical readers* could explain how such sufferings arose." Further on we are told that "the bile also contains soda as a special and indispensable constituent, and so do all the cartilages of the body. *Stint the supply of salt* therefore, and neither will the bile be able properly to assist the digestion, nor the cartilages to be built up again as fast as they naturally waste."

I trust after this that we shall hear no more official nonsense, on the question of giving or withholding salt from cattle food. The unchemical officer of excise cannot be blamed for not understanding such matters which belong to the domain of the agricultural chemist, and not to the Preventive Department of India.

After crude salt, the next most valuable saline manure for wheat and all cereals, is the nitrate of potash, or saltpetre. An immense quantity of this valuable salt was annually sent to China, and much of it was there destroyed by being made into fireworks. A good deal went to London for conversion into gunpowder, and nitric acid. But as Peru

now supplies England with the nitrate of soda, at a cheap rate, the nitric acid is made therefrom, in preference to the expensive saltpetre of Bengal.

I know of no more useless way of disposing of nitre, than converting it into fireworks, and for every 102 pounds of nitre, so consumed, 46·55 of potash and 53·45 of nitric acid, are lost to the farmer beyond redemption.

Scientific agriculture teaches us that the gluten of wheat is derived from nitrogen, and we know that 28 parts by weight of nitrogen, and 74 of oxygen, constitute 100 parts of nitric acid, as also that 82·53, of nitrogen and 17·47 of hydrogen constitute 100 parts of ammonia.

Farmyard manure contains ammonia in abundance, which, though unseen, is constantly passing off as vapour, and thus the greater part of its nitrogen is wasted; but the nitrogen of saltpetre is fixed, and by being in combination with potash, it supplies the growing plant with that most valuable alkali; and as the phosphate of potash, the principal mineral matter in the flesh of man and beast, cannot possibly be produced from the constituents of ammonia, it follows that saltpetre possesses *per se* very valuable chemical properties in a most convenient compact and economical form.

It has been carefully explained that gluten is the most valuable part of wheat, and according to the analysis of "*Kekule*," gluten obtained from a starch manufactory, yielded from 1 to 1½ per cent. of ashes, which contained of,—

Potash	7·47
Soda	2·14
Lime	17·31
Magnesia	12·08
Per Oxide of iron	7·21
Sulphuric acid	0·69
Chlorine	0·08
Phosphoric acid	52·95
Loss	0·13
	100·00

From a consideration of these facts and figures the following conclusions may be safely drawn, viz: That the large proportion of phosphoric acid and potash needed by wheat, can, in India, only be produced by the liberal use of fossil phosphate of lime and saltpetre, and as the notable proportion of soda and magnesia, present in first class wheat, is beyond a doubt, derived from the salt used as manure, it is demonstrated that unless the incalculable mineral wealth, now locked up in the "*Sewalliks*," is turned to pratical account, and cheap salt and nitre (as well as the saline manures required for other crops) are freely placed within the means and reach of the agricultural classes, the laudable intentions of His Grace the Duke of Argyle, and of His Excellency The Earl Mayo, Viceroy and Governor-General of India to confer on Hindoostan, the great and lasting benefits of an improved agriculture, will be, I regret to say, entirely and absolutely frustrated.

Newcastle, 29th June 1871. H.

INDIAN PESTS.—I.

THE MUNGOOSE.

THE mungoose is one of the most prominent, perhaps the most prominent of Indian pests. Bold, wary, and active, he carries on his depredations at our very doors, and is off to cover again so sharp, that rarely indeed is even a glimpse of the culprit caught. When his conscience is clear however, or rather (for his conscience is never clear) when he feels confident that no definite fault can be certainly laid to his charge, he is more ready to assert his privileges as a free citizen, though he cannot conceal his consciousness that he is not popular. He sleeps little, though strictly speaking, a nocturnal animal. At all hours of the day we may see him stealing along our hedges, taking advantage of every bush and clump of grass, stopping every few yards to see if the way is clear, and making a sudden rush across any open spot in his road. His presence is generally proclaimed by the outcries of the minas and bulbuls, ever the foremost of the feathered tribe to announce a foe. Habitually on the alert, he sneaks along as if he saw nothing and cared for nothing; and if discovered, where he cannot instantly plunge into the vegetation, he looks about with a look of innocent wonder, and then retires modestly to some retreat; only to re-appear however, when the coast is clear, at some spot nearer his destination—the most suitable cover in the vicinity of the poultry-yard. Once there, the wily creature manages to be ubiquitous without ever showing himself. But let a hapless chicken come within a yard of any part of the grass or the shrubbery, and a tremendous cackling from the whole inhabitants of the yard brings out a host of servants, who after a lengthened search can report only that feathers were flying all about the place, and that a bird is missing. This will be repeated day after day in spite of all precautions. In watchfulness, the mungoose surpasses perhaps all other animals not guided by scent. You may stand sentry, gun in hand, hour after hour without avail. If you could see the mungoose, the mungoose sees you first, and resists the most tempting opportunities to spring on his prey. But on the spot he is; for only withdraw for five minutes, leaving some one to watch for his coming if you like, and a sudden uproar among the fowls will tell you that he came long ago and was there all the time. By night his tactics are the same. The verandahs, the stables, the servants' quarters are unmolested; but omit for a single night to close up the rat-hole at the bottom of the fowl-house door, and in the morning you will find five or six of your finest hens with their throats torn. But once leave your bird-cage out till after dark, and wherever the mungoose may have been other evenings, that evening he is sure to be passing your door. We remember a friend who was rearing a brood of chickens in a large parrot cage. After feeding them one evening at sundown under the porch, he thoughtlessly left them standing there. He came out again in about a quarter of an hour, but found that three of his pets had had their heads torn off through the bars of the cage. About a hundred yards off master mungoose was trotting along, apparently on some private errand.

There are the usual ways of getting rid of this intolerable pest, the gun and traps. When a mungoose takes up its residence in a compound, it passes certain ways at nearly the same hours every day; and if there be a family of them, they often go together in a string. As the mungoose, though easily alarmed, is not suspicious unless it has good cause, it may by a little care be met and shot from behind a bush or wall on these occasions. As to traps, the mungoose is very cunning, but we have twice known one (the same one we believe; it escaped the first time) caught in a box-trap after it had been left in the animal's haunts for several days. Before entering, the mungoose went round and round the trap many times, and one day mounted on the top of it. Of course a steel snap-trap, if large enough, would be more effective. The bait used on the above occasions was first a dead chicken, and the second time a dead bandicoot. Though essentially a beast of prey and eager for warm blood, the mungoose will, if hungry, eat carrion. We have not mentioned poison, simply because we never heard of its being employed to destroy these animals; but there can be none but a superstitious doubt that if introduced into the body of a dead bird, snake, or other animal, it would be swallowed by and kill the mungoose.

The mungooses are a genus of the *Viverrinæ*, or Civets, a sub-family of the great order of *Carnivora* (beasts of prey). The sub-family are at once conspicuous by their long and slender bodies, and by their short legs and consequent small height. Their muzzles are more produced than in any others of the order, and they have all long tails. This general appearance will be at once suggested when we name the civet-cats, mungooses, and *menooreas* (tree-cats or toddy-cats) as belonging to the *Viverrinæ*. Other points of similarity, appearing on a closer inspection, are that they possess the power of contracting their pupils *circularly*, are nocturnal in their habits, and have, with one or two exceptions, rough, coarse, hair. Some have the hind feet plantigrade, but most walk on their toes like the cat and dog tribes. Nearly all secrete a powerfully odorous substance, typified in the much-prized perfume of the civet-cat. They have twelve incisors or cutting teeth, and four canines; but the molars vary in number, not always being the same even in the genera. The scientific name of the genus of mungooses is *Herpestes*: they are marked by several very distinct features. The hair is always long, and has in a conspicuous degree the harshness characteristic of the sub-family. In general, moreover, each hair is of several colours alternately arranged, giving the animals their peculiar pepper-and-salt appearance. But what first strikes the eye in this genus is the tail. Long, as in all the *Viverrinæ*, in this class the tail is also bushy, especially at its junction with the body, whence it tapers to the point which is black in several species. Without the hair, the tail is very slight, except at the base, and the skin of it is much finer than that of the body, so as sometimes to come away if the animal be lifted by the tail. In marked contrast to some of the other genera, the mungooses have small powers of climbing and seldom leave the ground. With the exception perhaps of one or two Himalayan

species, this genus, though possessing the civet-pouch, do not give out the odorous secretion. They are further marked by small rounded ears, not sticking up above the head as in the civet-cat, which gives them a lizard-like aspect. They have five toes to each foot, hind and fore: and can partially draw in their claws like the cat. Mungooses have sharp snouts, short powerful limbs, small feet, and brown dull eyes with a stolid and horrible expression. Their habits are very active, and their disposition savage. The type of the genus in the ichneumon of Egypt.

Seven species of mungoose have been identified in India. They range from thirty to forty inches in length, of which the tail is almost half. The largest is *H. cittiollis*. Five seem to be confined to jungles, and have been killed principally on the Eastern and Western Ghauts, the Himalayas, or the Neilgherries; very little is known of their habits. They vary in colour from tawny to reddish: and a Himalayan species, the smallest in India, is prettily freckled with yellow. One, conspicuous by the black tip to its tail, is very common on our own hill stations, Matheran, Khandalla, &c. They may be seen at any hour of the day prowling about in search of lizards and small birds, or coming out of their holes at dusk, followed by their young. The other two are found all over the plain of India: one, *Herpestes Malacensis*, being confined to Bengal and North India, with Assam and Burmah; and the other, *H. Griseus*, replacing it in Southern, Central, and Western India. They differ very little in colour, but the latter has the advantage in size, some specimens measuring nearly three feet.

In this part of India, the mungoose is known to bring forth its young (three or four at a birth) in the hot season, but they probably have a litter about the end of the monsoon also. They devour snakes, rats, mice, and birds, and are very greedy of eggs; but must depend chiefly for their food on lizards, many varieties of which abound in the grass and undergrowth in the hot season. The slender and supple form of the mungoose enables it to follow its prey into much narrower holes than one would suppose, judging from the size of the animal. It can however, easily enlarge or deepen a hole, as its claws are formed for digging. The mungoose has great courage, and will readily seize poultry and rabbits; and they doubtless destroy hares in the fields at night. Mungooses live generally in pairs, and are found in all descriptions of country, in jungles, or living in holes in open plains, in the neighbourhood of villages, and in the compounds and hedgerows of every cantonment. They seem indifferent to wet, and are to be seen moving about in the long grass during the rainiest days of the monsoon. The mungoose is often tamed; and, unlike many animals, has no disposition to go back to a wild state, but stays about the house, showing much attachment to its master. In confinement it loses some of its sharpness and cunning, and occasionally falls a prey to Jones's dog. It is however rather tenacious of life. Its cry is a short, sharp, bark, which is seldom uttered. The mungoose moves at a steady, shuffling trot, its head low, and its belly close to the ground, but when reconnoitring, or watching its prey, its movements are graceful and agile as those of a serpent. It runs by a succession of powerful bounds.

Many experiments have been made with the view of ascertaining the truth of the popular idea of the insusceptibility of the mungoose to snake-bite. The thickness of the animal's skin renders it difficult to make sure that the snake's fangs have reached the blood vessels, in cases of apparent immunity; and on the other hand, when the mungoose has died, it has been suspected to have been the result of rough treatment during the trial. Mungooses are known to eat small snakes, and they are so expert at catching them that it is doubtful if they ever get bitten in a state of nature. And this may probably be said of the different hill species as much as of the well-known animal.

The family of *Viverrinæ* is unrepresented in Britain, and all Europe has but one species of ichneumon or mungoose, *H. Widdringtonii*, found in the Sierra Morena mountains. The genus, comprising many Asiatic species unknown in India, is also largely represented in Africa; and it is interesting to find travellers, from Egypt and Abyssinia down to the Cape of Good Hope, remarking the same active habits, grizzled appearance, and tameable disposition, so familiar to us in this country. The oft-mentioned skill too, with which the mungoose seizes snakes by the throat and avoids their bite, has been observed in the African species. *H. badius* is described as apparently restricted to sandy districts covered with brushwood, and as occasionally caught sight of rushing from one copse to another. Curious to state, only insects were found in the stomachs of those examined, though the natives said that they preyed upon lizards, snakes, rats, &c. It is quite likely that locusts and other large insects are eaten by the Indian mungoose. Strangely enough, the knowledge of an antidote to snake-bite is attributed to the African species by the natives of that continent.

Dr. Horsfield tells of a Java mungoose that it is found most abundant in the large teak forests, and that it is very expert in burrowing in the ground in pursuit of rats. It possesses, he says, great natural sagacity, and it willingly seeks the protection of man. In a domestic state it is docile and attached to its master, whom it follows like a dog. It frequently places itself erect on its hind legs, regarding every thing that passes with great attention. It is of a very restless disposition, and always carries its food to the most retired spot in the place where it is kept, to consume it. It is very cleanly in its habits. It is exclusively carnivorous, and very destructive to poultry, employing great artifice in the surprising of chickens. It has been observed that its sanguinary character shows itself occasionally in a manner that renders it dangerous as a domestic animal: and it indulges at intervals in fits of excessive violence.

Mungooses closely resemble in their habits, and seem to replace in the torrid zone, the martens and weasels (*Mustellidæ*, a different family) of more northern latitudes. Several of the latter (a brightly painted weasel included) occur in the Himalayas; and one species (a marten) is found in the Neilgherries. A curious semi-aquatic animal, allied to the mungooses, is found in Nepal. It is said to feed on crabs and frogs.

EDITORIAL NOTES.

The land under cultivation in Australia, in 1871, was 900,000 acres against 530,000 in 1861.

Offal is being now turned to account as manure. Thus we learn that in France the bodies of dead animals are utilized by immersing their soft parts in a feeble solution of hydrochloric acid, which soon transforms them into an odourless pulp. This, when mixed with phosphate of lime, gives a manure of the best quality.

It is stated by an American journal that the eggs of the common hen, with those of many other birds, present certain external characteristics by which we can determine beforehand their sex. If male, the egg has, at its pointed end, small folds and wrinkles; while, if female, it is quite smooth and well rounded off at both ends.

A Machine for planting potatoes has been patented in America, which, we are told, makes the furrow, deposits the seed, and covers it up going only once over the ground, and the machine can be used with either one or two horses. Machines of this character are much needed in India, but it will be years, we fear, before improved agricultural implements are introduced generally throughout the country.

Forestry in the Punjab, according to our Lahore contemporary, is no better managed than in any other province in India. Regarding the Punjab forests, *Indian Public Opinion* writes:—

"It is quietly admitted that while the forests are being made to yield up their wealth, 'plantation has been too long neglected in the province,' and that the efforts hitherto made to ensure a sufficient stock of new trees have been 'desultory and unsystematic,' and the local Government insist on the necessity for systematic and energetic effort to plant largely and maintain the supply equal to or in excess of the demand. Until this be done on the most liberal scale we cannot accept the entire value of timber brought into market as assets in revenue account of profit and loss. It is indeed reaping where we have not sown."

A [illegible] species of the genus [illegible], species cristata, is, the Pioneer informs us, now in flower at the Khosrow Bagh at Allahabad. This is believed to be the first instance of any orchids of this very delicate genus flowering in the plains of the North-West. In the elegance of its shape and the purity of its colour, it is supposed to be unrivalled among orchids: the petals are of a dazzling white, and the labellum tinged with bright yellow.

THE *Pioneer* speaks of the existence of a tree in Tasmania, known as the fever gum. It is now being largely cultivated in Algeria, the South of France, and Corsica. The tree is of rapid growth in marshy soils from which it arrests the generation of marsh miasm, its wood is hard as teak, impregnated with a camphor-like odour, and gives an extract of notably astringent power, and an alkaloid allied to quinine. Should such a tree thrive in India, its introduction would be a benefit of no small amount.

THE *Lucknow Times* furnishes us with several instances of plants that will not propagate by seed. We lately mentioned the sugar-cane as one. The bamboo it says is another. The rose is never propagated except by cuttings, and our contemporary has not heard of strawberry-plants growing from seed. The same journal mentions a fact in connection with the plantain-tree which furnishes a curious illustration of the effects of human interference with the processes of nature. The parent tree will give a good yield for the first two years, and begin to degenerate in the third. The mangoe grown from seed is seldom equal to the parent tree in quality.

THE Paris correspondent of the *Indian Statesman* writes, that from experiments made in the Hotel Dieu, it has been shewn that the least nutritive food in the world is the meat of prize cattle. "Adipose degeneracy is the result of preventing oxen destined for the slaughter-house, taking natural exercise while the fattening process goes on. The protoplasm or vital energy of the beast is lower than in a vegetable, and men fed upon its flesh, run down in strength and activity. Nature has made severe enactments against overfeeding in the brute creation, no less than in the human family. The languid heart, the feeble digestion, the swollen liver, and the absence of recuperative force, are the penalties which man and beast must undergo, if either goes beyond the limit of temperance."

THE *Friend of India* learns from a Melbourne paper that a tree was lately felled at Sandy Creek, Wagga Wagga, for the purpose of securing honey, which it was known had been collected there by a rather large swarm of bees. It says:—"When the tree was cut down there was found in the hollow one of the most astonishing collections of honey ever known, probably to have been gathered by one swarm of bees. There were several immense layers of comb ten feet in length, and of great density, extending along the inside of the trunk, and almost entirely covering the hollow of the tree. After it had been carried home (having been wasted considerably by the fall of the tree, and the primitive mode in which it was collected) the comb yielded over two hundred pounds of honey of the purest quality."

THE Madras Government have received some genuine Manilla tobacco seed for experimental cultivation in the Presidency. According to the local journals, the seed will be distributed to the Agri-Horticultural Societies at Madras and Cotacamund, to Mr. R. A. Campbell (Dindigul), and to the Collectors of the Godavery, Trichinopoly, Tinnevelly, Coimbatore, South Canara, and Malabar Districts; also to the Collectors of the Ganjam, Vizagapatam, Kistna, Tanjore, and Madura Districts, with the request that the results (with samples of produce) may be reported to Government through the Board of Revenue. A supply of the seed will be sent also to the Chief Commissioner of Mysore and to the Residents at Travancore and Cochin for experimental cultivation in those territories, with the request that Government may, in due course, be informed of the results of the experiment with samples of the produce.

THE *Delhi Gazette*, quoting the Batavia *Handelsblad*, gives an account of a vegetable wonder to be seen in that city. In the garden attached to a Chinese residence is a wonderful plantain-tree, about five feet high, and of moderate thickness. It shows but two large leaves, but has more than twenty flower clusters hanging down along its sides, some of which have already opened. People, old and young, rich and poor, come from far and wide to witness this wonder; and the Javanese and Chinese pay great respect to the plant, and place offerings and smoking incense all around it. "Some bring flowers and strew them under the tree, others gather some of the plantain flower, hold them over the smoke of the incense and afterwards wrap them in their pocket handkerchiefs with great care. All lay money down, and an eye-witness says that he saw the pile of coin becoming greater and greater to the intense joy of the owner of the tree."

THE obstacle to the development of an extensive trade in the fibre of Rhea or China grass, is the absence of suitable machinery for separating the fibre and bark from the stem, and the fibre from the bark, the cost of effecting this by manual labour being very great. With a view of removing this difficulty, Government, as our readers know, have for some time held out a prize of £5,000 for the best machine or process for effecting this purpose, and the *Gazette of India* announces that the public competition for the prize will take place on the 1st of April. The competition will be held at the Government Rhea Plantation at Saharunpore, where competitors are to have their machinery ready for trial by that date. The prize machine is to be transferred, if required, to Government at 5 per cent. above cost price, the patent rights also, if required, on payment of a royalty of 5 per cent. on the cost price of all machines manufactured under the patent during its currency. Rewards of moderate amount will be given for meritorious inventions, even though failing to meet entirely the conditions laid down for the competition.

ACCORDING to recent observation, oak timber appears to be rapidly disappearing from Europe. We get the following information from an English journal:—"In France, since 1000, no oak has been felled until full-grown, that is, until within thirty years of its probable decay. The consumption of oak timber in France has doubled during the last fifty years. In 1800, £170,000,000 worth was consumed, of which £500,000 worth was imported against £5,000,000 worth consumed in 1820, of which £400,000 worth was imported. France requires every year 15,000,000 cubic feet of oak timber for wine casks, 600,000 for her fleet, 160,000 for railway stock, and 750,000 for building purposes. In 1828, the total value of imported staves was £800,000; at present the total value is £5,000,000. A similar increase of the importation of oak for the next thirty years would probably double the price. France, after losing Alsace and Lorraine, contains 135,000,000 acres, of which 20,000,000 are covered with forest. The same enormous consumption is going on all over Europe, and the supply decreases yearly."

A CORRESPONDENT in Plymouth County, Massachusetts, writes to the Department of Agriculture, Washington, urging the formation of Farmers' clubs and the frequent meeting of farmers for comparison of views, &c. He says:—

"If we had Farmers' clubs organized in all the towns, and these in communication with a central head, any important fact established could be at once made known to all the clubs throughout the country. The most important work for the clubs would be to establish facts by actual experiments. This is our great want at present. We have very little positive knowledge in regard to the best methods of applying labour or material to the soil for any crop. This ought not to be. It is true that climate and soil have something to do with the methods; but with organized effort and experiment, the best methods of planting and cultivating our principal crops may be developed, and thereby some progress be made in the right direction. Let a Farmers' club be formed in every town, and let no year pass without the institution of some experiment in agriculture for the instruction of the members, and when the results are important, let the facts be communicated to the Department of Agriculture for more general dissemination."

At the Institution of Civil Engineers on January 30, Mr. George Gordon, M. Inst. C. E., read a paper "on the value of water, and its storage and distribution in Southern India." The object of the paper was to deal with the probable results of works of irrigation as commercial speculations. The author submitted the following conclusions:—

1st. That irrigation would benefit the cultivator to such an extent as to enable him to pay a water-rate equal to two-thirds of the increased value of his crop, and still leave his own profits from 50 per cent. to 400 per cent. in excess of those derived from dry cultivation. 2nd. That the most profitable application of capital would be found in the construction of storage reservoirs as an addition to distribution works already in existence, and that these would yield a net return of 46 per cent., after paying one-third of the gross revenue to the existing works, and increasing the revenue of such works by 4½ per cent. 3rd. That the arbitrary water-rate of 12s. per acre was, on the data assumed by Government, insufficient to yield a fair return directly on the average of new irrigation works, unless these included the storage of water for a second crop. 4th. That the profitable employment of capital in irrigation depended chiefly on the recognition of the principle that the water-rate should be fixed with reference to the value of the crop produced by and the cost of the works in each case, and that otherwise many very beneficial projects would remain unexecuted.

According to the *Englishman*, the Commissioner of Sindh has discovered a process by which "Oosur" soils may be reclaimed:—

"When the salt is in moderate quantity, a crop is sown in spite of it, and the stalks of whatever is produced are cut off and left on the ground, into which they are afterwards ploughed to decompose. Where the land is subject to inundation, the next rise produces a film of good soil, which is also ploughed in. Another crop is then sown, which gives a superior yield; and repetition of the process described leads to further continual improvement. The same plan has been tried where fresh water was used for irrigation, and given good results; and there appears to be no reason why it should not be generally adopted. The possibility of remunerative success depends of course on the proportion of saline matter present in the soil."

A similar process says the *Lucknow Times*, is already in use among the native cultivators, with the addition of deep ploughing and turning up of the soil. "Whenever the quantity of "reh" or "loni" in the soil is not too great for the attempt to be remunerative, and the landlord consents to forego his rent for the first few years, our cultivators manage to reclaim it. The trial crops sown are generally the inferior cereals like *bajra*, &c. If a plant could be discovered which might possess the virtue of absorbing or decomposing the salts in a greater degree than other plants, the process perhaps might be somewhat simplified. There are certain plants that grow vigorously in an over-saline soil, and might perhaps be made use of."

A correspondent writes.—Is it known by whom or when the forage plant Lucerne was introduced? If so, a monument should be erected to his memory. Like many other long cultivated plants, its native habitat is rather hazy; the South of Europe Persia, and Peru have each had the honour accorded to them. An easily managed crop, producing nearly 50 tons per acre yearly, and sold cheap at 100 lbs. for a shilling, is worth attention. Let us see how it is managed; the seed is sold in Poona about 10d. per lb., the natives lay out the ground for irrigation in beds about 6 feet by 6 feet, and sow the seed broad-cast about 25 lbs. to an acre. I prefer sowing 20 lbs. to an acre with the common native seed drill, as the weeding is more easily effected, and where a good head of water can be obtained, I have the beds 60 feet by 20 feet, so that the irrigation does not require such constant attention, and the man in charge can be weeding or cutting the crop while the watering is going on.

"November to February is the best sowing season, as at that time it has fewer weeds to contend with while young. Lucerne is not particular about the kind of soil, provided it is rich and deep. In the Deccan one sowing lasts about 3 years. It is fit to cut six weeks after sowing, and on a good soil three hundred maunds per acre can be cut throughout the year. About Poona it is generally killed by the soaking rain during the monsoon season, but if the drainage is thorough, it will bear a heavy rain-fall. Irrigation is required about once a week in hot weather."

Mr. Emerson discourses in one of his "Essays" upon the occupation of the farmer, as follows:—"The glory of the farmer is that, in the division of labour, it is his part to create. All trade rests at last on his primitive authority. He stands close to nature: he obtains from the earth, the bread and the meat. The food which was not, he causes to be. The first farmer was the first man, and all historic nobility rests on possession and use of land. Men do not like hard work, but every man has an exceptional respect for tillage, and the feeling that this is the original calling of his race, that he himself is only excused from it by some circumstance which made him delegate it for a time to other hands. If he had not some skill which recommends him to the farmer, some product for which the farmer will give him corn, he must himself return into his due place among the planters. And the profession has in all eyes its ancient charm, as standing nearest to God, the first cause. Then the beauty of nature, the tranquillity and innocence of the countryman, his independence, and his pleasing arts—the care of bees, of poultry, of sheep, of cows, the dairy, the care of hay, of fruits, of orchards, and forests, and the reaction of these on the workman in giving him a strength and plain dignity like the face and manners of nature—all men acknowledge. All men keep the farm in reserve as an asylum, where, in case of mischance, to hide their property, or a solitude if they do not succeed in society. And who knows how many glances of remorse are turned this way from bankrupts of trade, from mortified pleaders in Courts and Senates, or from the victims of idleness and pleasure! Poisoned by town-life and town-vices, the sufferer resolves:—"Well, my children, whom I have injured, shall go back to the land, to be recruited and cured by that which should have been my nursery, and now shall be their hospital:—

"The farmer has grave trusts confided to him. In the great household of nature, the farmer stands at the door of the bread room and weighs to each his load. It is for him to say whether men should marry or not. Every marriage, and the number of births, are indissolubly connected with the abundance of food; or as Burke said, 'man breeds at the mouth.' Then he is the Board of Quarantine. The farmer is the hoarded capital of health, as he is also the capital of wealth, and it is from him that the health and the power, moral and intellectual, of the cities come. The city is always recruited from the country. The men in cities who are the centres of energy, the driving-wheels of trade, politics, or practical arts, and the women of beauty and genius, are the children or grand-children of farmers, and are spending the energies which their father's hardy silent life accumulated in frosty furrows, in poverty, necessity, and darkness. In English factories, the boy who watches the loom, to tie the threads when the wheel stops, to indicate that the thread is broken, is called a minder. And in this great factory of our Copernican globe, shifting its slides, rotating its constellations, times and tides,—bringing now the day of planting, then of watering, then of weeding, then reaping, then of curing and storing—the farmer is the minder. His machine is of colossal proportions; the diameter of the water-wheel, the arms of the levers, the power of the battery, are out of all mechanic measure, and it takes him long to understand its parts and its working. This pump never "sucks"; these screws are never loose; this machine is never out of gear; the rat and plane-wheels and tires never wear out, but are self-repairing. We see the farmer with pleasure and respect, when we think what patience and utilities are at work. He knows every kind of labour. He changes the face of the landscape. He lives on a new planet, and he would know where to begin; yet there is no arrogance in his bearing, but a perfect gentleness. The farmer stands well on the world. Plain in manners as in dress, he would

and ships in palaces; he is absolutely unknown and inadmissible anywhere. Lords or Kings he never shall be heard of in them. Yet the grovelling-room heroes, put down beside him, would shrivel in his presence—the solid and unexpressive, they expressed to gold and lead. But he stands well on the world, as Adam did, as an Indian does, as Homer's heroes, Agamemnon and Achilles do. He is a person whom a poet of any clime—Milton or Cervantes—would appreciate, as being really a piece of the old nature, comparable to sun and moon, rainbow and flood; because he is, as all natural persons are, representative of nature as much as these. That uncorrupted behaviour which we admire in animals and in young children belongs to him, to the hunter, the sailor—the man who lives in the presence of nature. Cities force growth, and make men talkative and entertaining, but they make them artificial. What possesses interest for us is the natural part of each, its constitutional excellence. This is for ever a surprise, engaging and lovely; we cannot be satiated with knowing it, and about it, and it is this which the conversation with nature cherishes and guards."

AGRICULTURE IN EUROPE.

THE COST OF GROWING AN ACRE OF TURNIPS.

The subject was discussed at the recent meeting of the Western Ross Farmers' Society. Mr. Arras, Fodderty, read the following paper:—

In opening the discussion of this evening, I am anxious to clear away some difficulties that suggested themselves to me on first attempting to handle the subject. It may be asked at the outset what is meant by the cost of an acre of turnips. Is it what they can be grown for, or is it what they can be bought at? The first question is the one I will endeavour to answer as best I can. Then comes the question what is a crop of turnips? and that resolves itself into other two, viz., is the crop to be understood as a small crop grown at least expense; or as a large crop grown at a relative cost? You may grow a crop of 20 tons at a cost of £10, or you may grow a crop of 15 tons at a cost of £5, and you may of course grow a crop of "crops and roots" at a cost of little over the rent of the land. Which of these are we to consider the best system to follow? and it is a difficult question to answer unless viewed in relation to other crops. If turnips must be eaten upon the farm, the answer is easily given; if they be removed, the answer is more difficult. But in calculating the cost of growing this acre of turnips, future crops must be kept out of view, as in the present case we want to arrive at their cost as a crop, and as having no bearing on any succeeding crop. In other words, can we grow an acre of turnips on one year's tenancy to pay all outlay of labour, manure, rent, and other expenses? Or to put it in another way, do we grow our turnips as an auxiliary crop to have an influence on the whole rotation; or do we grow them because they are the cheapest food we can prepare for stock? I made the remark the other day to a friend that I thought we might try to grow each crop because we get intrinsic value for it. Oh, then, he said, what intrinsic value do you get from a crop of fallow? I said that is a manure, and ought to stand against the following crop. Farm operations are so strung together, as it were on one string, that it is very hard to isolate the cost of any one crop. But in the present hypothesis I will endeavour to do so, and will aim at having as good a crop as I can grow, on the footing that rent and labour are the same, whether I have a 30 ton crop or a 10 ton crop—labour the same of course in preparation, sowing, and hoeing, if not in storing. But I have detained you too long on preliminaries, and will now proceed to details. By the end of September we obtained access to our acre of land, from which we hope to obtain a crop of Swedish turnips equal to the labour, anxiety, and expense lavished upon it. We will suppose the land to be good friable loam, of ample depth to allow the top roots to bury themselves beyond the reach of over an average drought, rather too full of couch grass to suit the tastes of an economical estimator. The first subject of consideration is whether we ought to manure it on the surface before ploughing, or manure it in the drill in spring. Out of deference to generally existing custom, we resolve to defer the manuring till spring. The next matter to consider is how to plough it. Whether to give a single furrow of ten inches deep, with two horses; or two furrows, seven inches deep each, the one plough following the other, the last one having the mould-board removed; or a single furrow twelve or thirteen inches deep, drawn by three horses. We reject on this occasion the double furrow, as the benefit of such deep stirring would not be reaped from one crop, and to the cost of one crop we ought to confine ourselves at present. The same plea holds good in the three-horse-furrow. Having got that point settled, we proceed to have our acre ploughed by two stout horses ten inches deep. They manage to turn over four-fifths the first day, finishing the remainder next forenoon. Calculating ten shillings a day as a fair average value of a pair of horses and man, the cost of our first ploughing has been 12s. 6d. Leaving the frost to mellow and sweeten the new turned land, we leave it to the care of our wintry friend, till spring calls for its more multitudinous labour. During winter and when frost sets in, we take the first opportunity to cart out manure from the folds to a large heap conveniently placed for spring work. We fix on twenty-five loads of rough manure as a suitable quantity, the filling, carting, and unloading of which costs nearly 15s. About the middle of April we give a single turn of the harrows, at a cost of 10d., to level the surface and make the next ploughing or grubbing more easily done. Now comes the oft-debated question, whether the spring cultivation should consist of grubbing in opposition to ploughing, or a mixture of both systems. In the present case we grub first, as the land is dirty and not very stiff, the weeds coming up better than when cut by the plough. This is done at a cost of 2s. 6d. To reduce the clods and harrow out the weeds, we require to give four turns of the harrows, two in one direction, and two at an angle or at right angles to the first, at a cost of 3s. 4d. Immediately after the harrowing, and before the sun hardens the knots, the land is rolled at a cost of 1s. To disengage the weeds from the crushed knots and shake them out, a double turn of the harrows is given at a cost of 1s. 8d. This is followed by a turn of the chain-harrows to roll up the weeds into rolls, at a cost of 10d. The weeds are then gathered into heaps by hand, and removed by a man with horse and cart, at a cost of respectively 1s. 3d. and 1s. (2s. 3d.) As these workings have rather consolidated the land we now give it a light ploughing, which costs close upon 7s. 6d. (1¼ acres.) This is followed by three turns of the harrows, to separate and bring to the surface all the remaining weeds, at a cost of 2s. 6d. The weeds not being in this second gathering very numerous, nor the land very full of knots, we escape the expense of another rolling, followed by harrowing, chain-harrowing, and reharrowing, gathering the weeds by hand, at a cost of about 10d., and removing them for about 9d. (1s. 7d.) We next have to decide what portable manures to use, and fix on the following mixture, viz;—1 cwt. Peruvian guano, 2 cwts. dissolved bones, and 2 cwts. crushed bones, costing 44s. 6d. The expense of mixing and cartage brings up the portable manures, after being placed on the field ready to apply, to about 46s. We select a fine morning, say on the 12th of May, to begin sowing operations. On a farm of about 500 acres, the usual staff required for putting down turnips is five pair of horses, nine men, one boy, and ten women, finishing seven acres a day, consequently one acre is drilled up and sown for about 9s. 10d. The twenty-five cart-loads of manure carted out in winter may now measure 10 yards, which valued at 5s. 3d. per yard comes to 52s. 6d. The quantity of Swedish turnip seed sown has been 3 lbs. at 1s., making the value of seed sown 3s. Hitherto there has not been much in the management of our acre that has caused anxiety, as the working of it has been very much in our hands, but now comes a change. If when we shut the gate on the straight and regular drills with their six-drill edging round them, we could shut out all intruders, likewise it would from many a trouble free us. In the course of a few days, the tender shoots are seen here and there, and after a gentle shower and the sun at our back we can glance the eye along the rows from end to end; the question of expense which had been intruding itself on our thoughts is shelved for the present, and brighter thoughts fill up their place. We return to take a fresh look at our new friends in a couple of days. An eastern wind and a cloudless sky we had not noticed on first setting out, and as we open the gate about ten o'clock in the forenoon, we wonder where our friends have gone. Alas, here they are, looking very blue, round holes in some, decapitated stumps are others, and the rest decidedly hard up. As we gaze in sorrow, a sudden movement here, another there, and others everywhere reveal the cause. Thousands of Haltica pretmorum are holding high carnival on the young leaves. The name is by far too good for them, and if they would remain where they come from and halt there, we could understand their name better. However, the wind veers round due west, a refreshing shower brings health and vigour to our plants, and our vaulting friends are done out of their dinner. The rough leaf comes quickly on, and we send a man and horse to scrape the drills with a horse-hoe, which he does for 2s. 5d. The thinning we calculate at 3s., as it is better to spend an extra sixpence now than have the work hurried and ill-done. Again our enemies come to the attack in the shape of wood pigeons, and it is now that 2s. 6d. per pair of horses would be willingly paid if that would convert them into pies. Had we fixed a sum per acre for herding, none could have found fault. Before long another horse-hoeing is given, at a cost of 1s. 6d. This is followed by hand-hoeing at a cost of say 1s., and according to the cost of this last operation may we estimate whether the thinning has been done well or ill. Thus far the working expenses have been £3 11s. 2d., and the manures have amounted to £4 18s. 6d. together the figure is £8 9s. 8d.; but as we may find some difficulty in persuading anyone to give us that figure for the turnips grown on our experimental acre—for on asking a price we would feel inclined to add the rent of the land, say 40s., not forgetting tenant's

profits, taxes, and tear and wear of implements—we resolve to go on to the end. To occupy our spare time in autumn, we may turn now and again, and not without profit to ourselves, to consider our balance-sheet. Former calculated cost £8 9s. 8d., rent £2, tenant's profits at the modest sum of 10s., superintendence by grieve 2s. tear and wear of implements 1s. 4½d., taxes 2s. 4½d., together, £11 5s. 5d. It can easily be imagined how every damaged turnip is now looked upon with a jealous eye, the more so as we know by sad experience this winter that everyone broken by wood-pigeons, rabbits, and hares, requires the aid of no machinery to reduce it to pulp. Having these extra fears to push us on, we commence to store them. It is not my place in this paper to give other people's experience as to the best method of storing, either for speed or cheapness, consequently I will keep still, as I have strictly done hitherto by detailing my own experience.

To return to our 6,453 lineal yards of turnips to be lifted, we find it costs close upon 4s. to root and top them. To cart them home and have them thatched costs, in ordinary circumstances, 25s. 2d. When all is finished, the bill of costs, which I have now the pleasure of placing before the club for approval or otherwise, consists of the following items:—

Working expenses	£3	11	2
Manure	1	18	6
Rent	2	0	0
Tenant's profits	0	10	0
Superintendence	0	2	0
Tear and wear of implements	0	1	1½
Taxes	0	2	1½
Expenses of storage	1	13	2
	£21	18	7

The scope of my present paper does not permit me to enter into the question of how much of that cost ought to be distributed over the other years of the rotation. Certainly, a deduction for unexhausted manures is more than legitimate; at the same time I cannot see how anyone could expect to grow a good crop of turnips by a much less liberal management, even if the following crops were to belong to another interest. Were he allowed to sell them from the farm the value might cover the cost, but that I have nothing to do with to-night. It certainly seems a vast sum to talk of £1,202 as the cost of one hundred acres of turnips, but let us glance for a moment at a few rough details. Few give less than two pounds' worth of portable manures, and still fewer give less than ten carts of heavy manure in spring, which would be gladly bought in many districts for fifty shillings. In this club we have been told by a very practical farmer that he gave twenty loads per acre, or at the rate of five pounds. The working expenses, as I proved before, cannot be done for less than 71s. per acre, then we have rent, £200, and profits at 10s.—£50. In these five items we run up to £1,055 at once. Then we have seed, taxes, tear and wear, so that my former figure is nearly reached. Before sitting down I may mention that by manuring the stubbles in autumn we save fully 5s. 1d. per acre, besides being able to do double the work in spring, with the same staff of horses in drilling and sowing. A most successful and practical engineer made the remark to me the other day in answer to my question, if he could not devise some plan to enable us to lift our turnips independent of human hands—"Well," he said, "it is clear in the first place, that when you have the crop you must secure it at whatever cost, if you don't you lose it, and all your former outlay is gone too." I fancy we don't keep this enough in mind, and, if by writing this paper I have indelibly stamped on my own mind that our turnip crop is a most costly and valuable one, and worthy of being cared for after we have got it, I shall have no cause to regret having taken up the subject of the cost of growing an acre of turnips.

THE AGRICULTURAL LABOURER IN ENGLAND.

As correspondence in our columns has lately borne witness, the condition of our agricultural labourers is engaging increased attention. It is, to say the least, not altogether satisfactory even to those who are in the closest connection with them, and are in some degree responsible for them. Complaints of their gross ignorance, their superstition, their squalor, even of their half-fed and half-clothed condition, appear from time to time in the papers and now there are added to these complaints intimations of their unrest and discontent. The country gentry find that the peasantry are not as humble and as obedient as they were; the farmers have heard rumours of agricultural strikes; and such portents have actually appeared as a canon of the Church of England urging the labourers, and even assisting them to help themselves; and one of the members for Birmingham has presided at a public meeting in which they called attention to their grievances. That there is some cause for this rural disquiet stands confessed in the fact that only lately a Royal Commission has inquired and reported on the employment of women and children in agriculture. That there is a strong element of hope in it is shown by the very discussion of the condition and prospects of the labourer in the Farmers' Clubs. The magnitude of the question thus discussed is scarcely appreciated. Agriculture is the most wide-spread and the largest of our industries. The cotton manufacture gathers together great communities in Lancashire; the woollen trade make the vast country of York busy and populous; iron and coal cover whole districts with grimy and prosperous communities; but agriculture flourishes in every portion of the island, and dots over the whole surface with its little villages of labourers. Taking the Registration Districts of England and Wales, we find that the three millions and a quarter of acres which constitute the urban districts contain nearly thirteen millions of the population; but we also find that on the thirty-four millions of acres which constitute the rural districts, nearly ten millions of people live. The condition and prospects of the agricultural labourer is therefore not merely a question for the farmers and the squires—it is one of national importance and of imperial magnitude.

It is sometimes confidently said that, notwithstanding all our prosperity and progress, there was a time when agricultural labourers were better off than they are now. Perhaps the exact truth about them is that they have made little progress, while all around them the standard of comfort has been rising. Yet even the agricultural labourer is better off now than he was in the reigns of the last two Georges. The parson and the squire look after him better than their grandfathers did; he is himself more conscious of his degradations, and society is more alive to its duty. The particular evil from which he suffers in the present day is that which is incident to a transition state. Agriculture has changed from a patriarchal pursuit to a scientific business. Its old patriarchal relations are therefore dying away, and the new relations of the employed have not yet fully established themselves. The villagers are no longer dependents on the squire, as they were. The farmer no longer looks on his labourers as a part of his family, as he did when they dined together, the farmer and his family at the top of the table and the labourers at the bottom. But the traditions of agricultural wages date from those times, and the farmer pays the men and boys, whom he merely engages as an employer, very little more than his great-grandfather paid those whom he regarded as his natural dependents. The labourer, on his side, does not at all realise the change in his relation to his master. He has no idea of making his own way in the world. All his life long he lives from hand to mouth, eking out his miserable wages by perquisites and charities, and looking forward to Poor Law relief in some form as his natural and inevitable refuge in declining years. He rents his cottage as a favour from the landlord, for he cannot pay rent enough to make it worth-while to build for him; if he gets a little bit of allotment garden, it is granted him as a kind of charity to eke out his wages; and if he keeps a pig, which the farmers often regard as too great a temptation to peculation, he gets its food by fetching kitchen refuse from respectable houses. As to a farm-labourer keeping a cow, the thing is impossible, except in the remote Arcadia upon the border described by a Northumbrian landlord at a recent meeting in Croydon, "where the labourers can all read and write, and where it is not at all uncommon for one labourer to remain thirty or forty years on the same farm." There is no kind of encouragement to men to be provident, helpful, and thoughtful. If they saved money it would only spare the poor's rate. But how can a man save when he must keep his family on wages of from ten to fifteen shillings a week? So far from saving, such a man will squander. He will live literally from hand to mouth, as our agricultural labourers do. They marry without thinking whether they can keep a home; have large families, and never think of any duty they owe their children. As to health, education, and decency, such things belong to the squire, or the parson, or the farmer, or the parish. The labourer himself lives for the day, remembering that to-morrow he goes to the workhouse. The cure for these evils is not entirely in legislation. The Education Act would do something towards producing a better state of things if it made education universal. But unfortunately it is just in the rural districts that it fails to induce the people to establish School Boards, and where there are no School Boards there will be no compulsion. Yet as Mr. Forster has admitted, in these rural districts compulsion is much needed, and it is much to be hoped that he will succeed in making it universal. But how will education improve the condition of the agricultural labourer? It will certainly not make him more content with low wages and poor food and tumble-down cottages and undrained villages, with hard labour for all his active days and the workhouse in his broken-down old age. It may make him a better labourer, more active, more intelligent, more self-helping; and may thus make him worth better wages; but the farmers must learn that it is better wages to which education will lead and to which in fact, the whole social movement of the age is leading. We are told that it does not pay to build good cottages; and many landlords are building them at a loss out of good feeling; but no class of men ought to be dependent for healthy houses on the good feeling of another class, however certain it may be not to fail them. As a rule, however, the good feeling does fail, for the agricultural labourers live in hovels compared with which the poorest cottages of Lancashire factory hands are palaces. It may be hoped that the progress of sanitary legislation will lead to an improved

[illegible] improvement of these village dwellings, but the greatest hope of [illegible] from the creation of a desire for something better. [illegible] a better class of laborers; and [illegible] to better [illegible] a commercial pursuit, [illegible] farmer is thereby, and he must pay his workmen on commercial principles, and not after patriarchal traditions. It is always better to pay high wages to good workmen than low wages [illegible] men. The heavy, lumbering, ineffectual men who [illegible] of so many of our southern farmers, are as much an [illegible] as the men who here and there still draw the plough. The [illegible] has invaded and is fast conquering the fields, and with it there will come a race of men quicker in movement, readier in observation, and more prompt and resolute in action. Such men will not only be more useful to the farmers but more helpful to themselves; and their influence and example will do more to wipe up the vestiges and improve the position of the existing race of laborers than any other agency. Meanwhile we are glad to see that the farmers are themselves awake, and are willing to do what they can to raise a class whose present degraded condition is at once a danger and a disgrace.—*Daily News.*

AGRICULTURAL STOCK.

VALUE OF CORN-FODDER.

In the annual report of 1870, a digest of the views of numerous correspondents of intelligence and experience is presented, from which the following conclusions were drawn :—

1. Green corn-fodder is neither worthless nor the poorest of all soiling material.
2. It is best when planted in drills or hills, not so thickly as to prevent normal growth and development, cultivated to destroy weeds and grass, and cut between tasseling and earing, when the elements elaborated for production of the ear are stored in readiness for immediate use.
3. It is probable, both from the *rationale* of the case and from facts presented above, that in the more northern latitudes, a mistake, has often been made in sowing thickly southern corn which cannot mature, the fodder from which, fed in August, must be very nearly worthless. On the contrary, the fodder from northern corn, especially sweet corn, drilled widely and cultivated, and fed just before earing, is found to be very valuable.
4. Its value compared with lucern, millet, the best grasses, and other plants, containing a large percentage of nutriment, taking into consideration the quantity produced and the cost of its production, has not been determined fully, and should be decided by a series of thorough and exhaustive experiments.

Confirmations of the correctness of these conclusions are received from every direction, as the result of further and more careful experiment during the present year. Among the authorities repeatedly quoted to show the assumed worthlessness of corn-fodder, is the Boston Journal of Chemistry. The position of that journal is that "when raised from broadcast-sowing it is nearly worthless, but when sown in hills or in drills and cultivated with access of air and sunlight, it is of high value." An experiment made by the editor this season shows that fodder-corn planted in drills contained of dry matter, the water being evaporated in a drying closet, 17 per cent., while that from corn sown broadcast contained but 8 per cent., in which sugar and gum were almost entirely wanting. This illustrates the great superiority of stalks collected just as the ear begins to form.

At a meeting of the Western New-York Dairymen's Association, in September, Mr. Lewis F. Allen stated that, in experimenting with fodder-corn, he had planted one acre in sweet corn, which grew to a height of about 2½ feet, feeding being commenced when the corn began to tassel. The acre supplied sixteen cows twenty-three days, (equivalent to feeding one cow three hundred and sixty-eight days), yielding about 8½ tons. Common Ohio green corn, of which the crop was double that of the sweet corn, was then fed, and the cows appeared to relish it equally well. The result was a steady increase of milk and a large increase of butter.

In respect to a substitution of lucern in place of fodder-corn, Mr. Martin said that the value of the former as a food for dairy cows would appear to have been over-rated to some extent. It belongs to the clover family, and the milk of cows fed upon it is not equal for purposes of butter and cheese to milk from the grasses generally; and the butter and cheese obtained from feeding it are deficient in keeping qualities.

Mr. E. W. Stewart brought forward the practice of Mr. Fry, who raised corn in drills, dropping the seed in every third furrow. Cows were supplied one hundred and five cows four days, equivalent to feeding one cow four hundred and twenty days. Mr. Stewart held that when the corn-plant begins to tassel, it contained all the constituents of the grain.

Mr. Finney, of East Hamburgh, said that he had not found sweet corn capable of increasing the production of milk after it [illegible] the feeding was commenced in season the [illegible] and the cows retained in good heart and [illegible] *Agriculturist, Washington.*

* Maize.

DETERIORATION OF WHEAT.

This decline of deterioration in the yield and quality of certain crops, so manifest in the experience of a majority of American farmers, demand investigation. The fact that one field produces double the quantity of another adjoining, and that the yield of virgin soils diminishes year by year, calls for explanation and even reiteration of the reasons for such deterioration, and suggestions of remedies and means of recuperation. Recent inquiries have been directed to the present Commissioner of Agriculture relative to the diminution in the average yield of wheat. He has felt a personal interest in this subject, and enjoyed the advantage of many years of experience and investigation, and thus responds to such inquiries :—

Many farmers look upon the culture of wheat as the most profitable work in which they can be engaged, while some claim that corn is a more profitable crop. Let the question be settled by the fact that land is sometimes better adapted to corn than to wheat, but, be that as it may, the wheat crop is certainly of sufficient importance to claim our attention to all the prominent errors which exist with regard to its proper cultivation.

It is a curious and no less remarkable fact, that, in the midst of the use of highly improved implements, guided by experienced hands and superior knowledge of the science of agriculture, the production of wheat has gradually and certainly diminished in quantity in all the wheat-growing States. Why is this? May the evil be overcome? It is no solution of these questions to answer that the soil has been exhausted of those peculiar constituents essential to the growth and maturity of wheat, for this argument would lead to the conclusion that nature had not by her laws made provision for the perfect growth of wheat at all, and that ultimately this production must become utterly extinct. But this is an unwise as well as unprofitable conclusion. We must, therefore, resolutely face the fact that the cause of the failure is to be found in the farmer's want of skill and inquire how this skill may be improved.

Examine the present mode of cultivation in the wheat-growing States. Finding a field in clover, it is plowed in the fall or in the spring, and planted with corn. The corn having been taken off, it is plowed again the next spring and sown with oats, and upon this oats-stubble all the manure of the barn-yard is put. It is then plowed under, and the field sown with wheat, and when this crop is taken off it is either sown again with wheat, "stubbled in," as it is called, or it is sown with timothy in the fall, clover in the spring, and again is laid down to grass, remains two years, and then goes through the same rotation. This is the ordinary process of cultivation throughout all the Middle States, and it is by this process that our wheat crops have diminished at least one-third in the last twenty-five years, while there is not the same diminution in any of the other crops which make up the whole course. The products of corn, oats, and grass are as large if not larger than they ever were. The marked failure is in the wheat crop. It is visited by fly, midge, rusts, mildew, or it grows into straw without a corresponding production of grain. An experiment made upon my farm, and running through a period of ten years, induces me to say that the failure of the wheat crop is occasioned, in a great measure, by the improper use of barn-yard manure. Wheat is a delicate plant, both in its organic structure and the food it consumes, and yet we apply, in and of its germination and growth, the gross raw product of the barn-yard, filled with embryos of worms, bugs, midges, and beetles, giving a nauseous dose to the first germ of the wheat, and furnishing an unfit food throughout the whole life of the plant. Add to this the vermin which the contents of the barn-yard have brought upon the field, and then we may account for the midge, Hessian fly, mildew, rust, and all other evils which we have been accustomed to deplore when harvest comes.

I trust I may not be understood as depreciating the use of barn-yard manure: so far from this, I am convinced that human skill has never been able to concoct a combination of plant food so excellent as that which comes from the stable, when properly used. But the proper use of it is upon corn ground. After the grass has been cut and made into hay the second year, and when the tap-roots of the clover have attained the size which makes them valuable as renovators of the soil, let the grass grow up for few weeks; then haul all available barn-yard manure upon it, and scatter it over the ground; and as late in the fall as the season will allow plow it under deeply. Corn is a voracious plant, and will consume any food, however gross. Its roots are all-reaching and far-reaching; they will find the manure readily, and the crop will tell the story of its value. When the corn is taken off, and during the next winter, let the corn-stubble be broken close to the ground, raked off, and burned, or, what is better, hauled to the barn-yard, and in the spring as soon as the ground is dry enough harrow with a sharp and heavy harrow until the surface is smooth; sow oats without plowing, and roll after sowing. The manure is yet undisturbed, and not likely to make the oats so rank as to cause them to lodge. Oats will grow better and be more productive without plowing than with it. As soon as the

oats are off, let the stubble be plowed in as deeply as possible, by which the manure, covered before corn-planting, will be thrown to the top, and the scattered oats will have an opportunity to vegetate; then stir the ground again with the plow, thus destroying the growing oats, and thoroughly mixing the earth and upturned manure, which, by the lapse of time, has undergone a thorough decomposition and combined with the earth, and in this way has been made a food properly prepared for the wheat plant. The earth through its influence has been assimilated to the humus which was originally so productive of wheat. If the land under this treatment tends to become too mellow, let timothy be sown in the fall with the wheat, at the rate of one bushel to the acre, and clover in the spring at the rate of one bushel upon five acres. If no timothy be sown in the fall, the wheat will be greatly benefited by harrowing it with a sharp harrow in the spring. No fear need be entertained of injuring the roots, and the ground will be freshened and well-prepared for receiving the clover-seed. When it is sown, a roller passed over the ground will fix the clover-seed for immediate germination, and level the surface for the reaper and mower; and I may add, that the habitual use of a roller upon cultivated land, whether in corn, oats, wheats, barley, or clover, has a tendency to destroy the larvæ and pupæ of insects to an extent rendering them harmless, while all these crops are benefited by it.

In the Southern States there is no reason why cotton or tobacco may not be substituted in this course for wheat. It may be suggested that, when either of these crops is cultivated the last time, the land may be sown with clover, which by by the following June will grow to its full size, and may then be plowed under. If the ground be again plowed in September, it will be in the best condition for a wheat crop, or, what is better, if the clover be left until the following spring, when it shall have attained its full growth, the land will be in a condition to grow corn, cotton, tobacco, or anything else. This system, pursued for a series of years, may be relied upon for the production of crops perpetually, always using barn-yard manure upon the clover sod, and planting with corn. It is the enriching influence of clover roots and the rotation of crops which produce the result. Let it be remembered that there is little reliance to be placed upon the effect of a green crop turned under by the plow; ninety per cent. of it is water. It is the fall-grown *root* of clover that enriches the soil.

Care in the selection of seed wheat is of the very first importance. Discard all idea of mixing ingredients with it to destroy smut, rust, mildew, or anything else; for, beyond the mere operation of washing or the manure they may furnish, is it questionable whether they produce any good effect. Smut is a fungoid growth from a diseased grain of wheat, which by contagion will be communicated to the mass, but from which the mass may be purified by washing with soap and salt water. Mildew is a parasitic fungus upon the straw, by which the seed is never affected otherwise than by the destruction of the straw and consequent shrinking of the wheat in the head. The midge, Hessian fly, and weevil, are insects the consideration of which should be introduced in any discussion on the subject of the cultivation of wheat. The midge is a small winged insect, the larva of which is an orange-coloured maggot, found between the skin and chaff of the grain of wheat while it is in its milky state. The egg is deposited between the chaff and the kernel, and is so minute as not to be discoverable by the naked eye. The larva extracts the milk and destroys the grain. The Hessian fly deposits its egg, which is about the size of the smallest grain of clover-seed, upon the blade of wheat, from which it falls into the crotch of the plant or upon the ground; if upon the latter it perishes, and if upon the former it is hatched into a larva resembling a flax seed. As it grows, it lives upon the sap of the straw, and destroys it at its point of contact, which is usually in the first joint, so that it is broken off by the wind or its own weight. The weevil is a hard-shelled beetle, which preys only upon grain after it is matured. The remedy for smut and mildew is careful cultivation, frequent rolling, and selection of clean, pure, heavy seed. The weevil may be driven from barns or bins by any strongly smelling plant, such as mint or burdock.

There are involved in this discussion two simple principles of agriculture—the timely application of manure, and the proper rotation of crops. It may and probably will be said that clover will not grow successfully in the Southern States. With all due respect to the little experience which southern farmers have had in the use of this grass, I must insist that such is the character of the clover-plant, with its deeply penetrating tap-root, which nature intended for the supply of moisture and nourishment, that no other grass will endure more drought. Lime is one of the largest constituent elements of clover, and, if it be applied to the land, clover will grow almost anywhere, and wherever it grows the soil is renovated and enriched by it.

HORTICULTURAL SHOW AT SECUNDERABAD.

The January flower and vegetable show of the Secunderabad Horticultural Society took place on Wednesday and Thursday, 17th and 18th instant. Despite a season of unwonted [illegible] and the proportionate difficulties which must have [illegible] the gardeners of Secunderabad and its [illegible] and vegetable exhibited were quite equal [illegible] produce of more favourable [illegible] and Bangalore were still fresh within us, [illegible] honesty to confess ourselves astonished at the [illegible] bles, and not a little surprised at many of the [illegible] whilst (as a whole) equal in every way to the [illegible] galore, in two or three instances surpassed the [illegible] efforts (hitherto) of vegetable growers at that [illegible] I refer especially to cauliflowers, parsnips, and celery—[illegible] size and quality to the finest I remember having seen on the Neilgherries. The total absence of market-gardeners from competition struck me at once; natives, I learnt, do not grow for the market at Secunderabad, as they do at Madras, Bangalore, and Ootacamund. Inasmuch however as Horticultural Societies have done much to encourage and develop the latent talent of native husbandmen at the three places mentioned, it is to be hoped that as Secunderabad now boasts of a similar institution, its members will eventually command a supply of vegetables as plentiful and good as that of Bangalore. Private kitchen-gardening at Secunderabad is on the other hand almost universal: and to judge by what I saw last Wednesday, highly successful. The large and varied collection of English vegetables exhibited by Majors Swete and Pereira, would have claimed prominent notice anywhere, and Mr. Cole's contribution from the military prison (even allowing for his large command of labour) was beyond praise.

In flowers we found ourselves behind Bangalore, yet treading the ground she trod some three years ago, when Iresine Herbstii was prized and a Coleus was viewed with universal envy! The double pink were unusually fine and varied; verbenas as good, and phlox Drummondi very fair. All the other flowers, if not quite as novel to the eye as some of the recent introductions at Bangalore were, at all events quite up to show form, well grown, and vigorous.

The energetic Honorary Secretary Colonel Thomas, deserves much kudos for the excellent arrangements made for the public, and for the tasteful staging of the plants in competition.—*Madras Mail.*

WOOL AND ITS IMPURITIES

THE SUBSTANCE OF A PAPER READ BEFORE THE ASSOCIATION OF COMMERCE OF ROUBAIX BY M. FERON.

If it sufficed for the necessities of the divers industries dependent on wool, that the carded wool of commerce should be of good colour, its fibres smooth, clean, and parallel, we might congratulate ourselves on the progress made of late years in wool carding. But, unhappily, it is altogether different, when we come to consider the same wools with regard to their absolute industrial values; that is to say, their aptitude for taking dyes and their suitability for spinning and dressing. The great majority of wools used at Roubaix are but imperfectly purified from the earthy and fatty manures which they naturally contain, and from those with which they become contaminated in the process of carding, either accidentally, or to facilitate the operation. Now, these impurities are the essential cause of numerous imperfections in each of the subsequent operations, and, if not removed, perfection is impossible, either in dressing, spinning, or dyeing.

Conditioning.—This first operation has for its object to ascertain by absolute desiccation the true weight of wool in any bale. Samples are taken from the bulk of the cleansed and carded wool, of which it is desired to know the degree of humidity and carefully weighed; they are then submitted to a temperature of 105° to 110°. By this means the water they contain is evaporated, and, on reweighing, the absolute weight is supposed to be obtained. If the wools were really pure, this mode of ascertaining the value of the wools would be very rapid and sufficiently exact; but it is a matter of fact that all substances dissolved in a liquid hinder its evaporation and elevate its boiling point, and the influence thus exerted becomes greater, with increase of the affinity of the liquid for substance in solution.

Amongst the most common impurities of carded wool are to be found: salts of lime, derived from the water in which the wools are washed, and which form, with the oils of the wool and with the soap used, insoluble soaps, which add to the weight and deteriorate the wool, rendering it dusty and greasy; [illegible] substances used to adulterate it; starch, [illegible] silicate of potassa, &c., animal moisture, and glycerine, all increasing the boiling point of water; so that the [illegible] produced on wool by heating to a temperature of 105 degrees is proportionate to the degree of purity, and in no way to the amount of moisture it contains. Under these circumstances it is useless to [illegible] amount of moisture evaporated and estimate the [illegible] much pure wool, since it really contains salts of [illegible] soaps, glycerine, &c., which hold water with a [illegible]

[illegible] of [illegible] in the dyeing, requires, in order to form a stable dye, that [illegible] have some metallic substance, the bodies [illegible] being the mordants. Now, if the compounds [illegible] the colouring matters and the dyes are insoluble, [illegible] between the mordants and many of the [illegible] the soap in badly-washed wool, for instance [illegible] insoluble. If the mordants be a salt of [illegible], for example, it forms an insoluble iron soap, which effectually [illegible] the wool from taking a good pure tone of colour. In order to get a good result under such conditions, dyers are constantly [illegible] the habit of evading the obstacle, and dyeing without any mordant whatever; so that mismanaged cleansing gives rise to fraudulent dyeing, colours thus put on being merely superficial and valueless.—*British Trade Journal.*

PUNJAB COTTON CULTIVATION.

From an official statement we see that the estimated extent of land under cotton cultivation in the Punjab during the past year was 700,908 acres only, as compared with 811,740 acres in the year 1869-70, and 670,240 acres in 1868-69. The decrease is said to be mainly attributable to unseasonable rain. The estimate of the out-turn, however, is larger by nearly sixty thousand acres than in 1869-70, when the crop entirely failed in a part of the Delhi and Hissar Divisions. The average price during the year was Rs. 17-1-10 per maund of forty seers. Of the entire out-turn the trade returns show 107,841 maunds to have been exported from the province chiefly to Sind and the North-Western Provinces, and presumably for export from India. Country cloth, to the extent of 13,301 maunds, and European cloth, to the extent of 22,530 are also estimated to have been exported from the province. At the same time 35,761 maunds of cotton were imported, so that the net export was only about 70,000 maunds; and 9,294 maunds of country-made and 47,713 maunds European cotton cloth were also imported, leaving a net import of cloth of about 21,000 maunds. In the previous year the net imports of cloth were only about 3,000 maunds. The statement contains no information regarding the local manufacture of country cloth, though this is a subject of the last importance to the piece-goods trade. Some experiments were made by Mr. Login in the cultivation of cotton after the Egyptian method, which appear, as far as they have gone, to be remarkably successful, and certainly justify an extension of the trial. The Financial Commissioner who had recently had an opportunity of seeing one of the fields in which cotton had been grown on this plan, found the plants exceedingly healthy, well-grown, and prolific. From information afforded by the Sub-Overseer in charge it appeared that the success of the experiment was mainly due to the mode of sowing and to the thinning of the plants, by which means they had room to spread. The field had not been irrigated, but the rain-fall had been copious.—*Englishman.*

SILK.

The report of the Assistant Commissioner, Tharawdy Sub-division, states that silk culture has been pursued from time immemorial along the Pegu Yoma range of hills, and adds that the cultivators, who are principally Burmese, are looked down upon because their professed occupation involves the taking of animal life, and they live chiefly in villages apart from others. Fresh mulberry trees are planted each year, the previous year's trees being cut down in July, and the cuttings planted out in fresh ground and ready for the worms about the end of September.—*Bangalore Spectator January, 31st.*

MISCELLANEA.

[illegible] says that a Frenchman M. Brault, in a paper read before the French Academy of Sciences, stated that cane-sugar becomes [illegible] with grape-sugar under the prolonged influence of light. Having [illegible] ten grammes of white sugar, in fifty grammes of pure water, and boiled the solution for a few minutes, he placed equal portions in two white glass tubes, which were then hermetically sealed. One was deposited in a dark place, while the other was exposed to light. Five months afterwards the tubes were opened and the contents of that which had been exposed to light gave the reaction of glucose.—*Delhi Gazette.*

[illegible] MARCH.

The Foresters' Gazette.

BOMBAY, 21st March 1878.

FOREST CONSERVANCY IN CEYLON.

In discussing the question of Railway Extension, we must not forget what is involved in such words as fuel and forestry. In India it has been found that 30 acres are required to supply fire-wood for each mile of railway. We suppose the proportion in Ceylon is much the same. Care must therefore be taken that at convenient distances along our line provision is made for supplies of fire-wood. And has not the time come to imitate India in her special efforts to conserve forests which will yield not merely fire-wood, but good timber for railway, building, and cabinet purposes. Something has been done in checking the wasteful chena system, and the various Government Agents are expected to devote some attention to the conservation of forests. But unless we are to be, by-and-bye, entirely dependent on other countries for our supplies of timber, it seems time that a special department of forestry were here created. India has now a large number of men, who having graduated in Germany, have added the knowledge gained by local experience. A Ceylon officer, if deficient in training could be detached to India, and in a few months obtain all the knowledge that was necessary in addition to that contained in Forestry Manuals and in recently published Indian Blue Books. Special attention is required with reference to preserving existing timber and growing fresh forest near lines of railway and roads, while perhaps it might pay in some parts of the Island to form common roads on light tramways with reference mainly to reaching and rendering available supplies of satin wood and similar timber trees. Beyond some small experiments by the Director of the Royal Botanical Gardens, no efforts have been made to utilize, for timber-growing purposes, the vast prairies of the hill-country, which we call patenas. And even in the plains of the low lands, many of them too unhealthy for the systematic cultivation of cotton or other produce, surely timber trees could be planted and allowed to grow. We have vast tracts of forest which are not consumable. We want means to reach these, and we want forests raised in localities where it can be readily available. Posterity will find that we worked hard to destroy the forest on which so much of the beauty and the salubrity of a country depends. But do we not owe to posterity the duty of restoring with one hand at least a portion of what we remove with the other? In Australia, as well as India, this question of forest conservancy is receiving much attention, and we think it is one which in all its important bearings, ought to be submitted for the consideration of our new Governor when he arrives. The Eastern Province of the Island is fast advancing as a rice-producing territory. We must see to it that this and other portions of the Island do not retrograde in their function of supplying useful timber. The danger is that all timber near means of conveyance will be exterminated, no fresh supplies being put down. There is much information on the subject scattered through Government Records which could be condensed and rendered available, and we hope one of the earliest Sessional Papers added by Mr. Gregory to the valuable collection which this Colony owes to Sir Hercules Robinson, will be a comprehensive report on the Forest Resources of Ceylon, and the best means of utilizing, conserving, and extending them.—*Ceylon Observer.*

FOREST CONSERVANCY IN THE ANDAMAN ISLANDS.

The recently issued Parliamentary Papers, relating to forest conservancy in India contain a revised report by Mr. Kurz, of the Royal Botanical Gardens, Calcutta, on his visit to the Andaman Islands, in the Bay of Bengal, in 1866. At the Middle Straits which divide Middle from South Andaman, he observed signs which he regarded as indicating that the Islands have a tendency to sink, and at various points along the coast he noticed the encroachment of the sea. Estimating the gradual submersion to be one foot in one hundred years, it may be expected that in 1,000 years, all the stores and houses along the beach at Ross Island, Port Blair, must be submerged, and Middle Straits become open for navigation. The small fertile valleys of South Andaman opening towards the sea are preparing themselves gradually for mangrove swamps, and kuppalee trees are destroyed by the extending influence of sea-water. These trees however are still abundant, and their growing along the shores makes the working of the forests the more practicable. The kuppalee or palava is a valuable timber tree, growing up straight, and attaining a height of 80ft. or more, with a clean stem of 40ft. or 50ft., and a girth of 12ft. to 19ft. The wood is used for gun-stocks, and would be available for railways, machinery, &c., where great durability and strength are required. The tree belongs to the same natural order which yields the bullet-wood of Guiana. South Andaman is a hilly country, and the hills are clothed with dense forests of trees, often found entirely covered by climbing plants, which hang

from the tops of the trees-like gigantic festoons, and render the forests nearly impenetrable. The geological formations are identical with those of the Arracan coasts. Mr. Kurz gives a full account of the vegetation, so far as he could observe it; but he was obliged to leave the central region still a *terra incognita*. When he was entering the interior he was seized by the Burmese convicts assigned to assist him in his work, and was left tied up in the jungle by hand and foot; and in fact he found it impracticable to make his proposed excursions through the Islands. Around Port Blair and the penal stations, where the jungles have been cleared and cultivation has been begun, introduced plants are rapidly increasing and spreading towards jungle never yet trodden by a European. Mr. Kurz remarks that, owing to the low scale of the inhabitants, and their living isolated from communication with surrounding countries, the Andaman Islands have never been influenced by the agency of men, and therefore the type of their natural productions is still most peculiar; but in a few years it may become untraceable in consequence of importations. With reference to the origin of the Andamanese aborigines, he suggests as of importance the fact of their having a peculiar name for almost every plant. An opinion prevails that the level lands when cleared, are unhealthy, and hence it is no wonder to see cultivation begun on the highest summits, and the fertile valleys or level lands left covered by dense jungles. Mr. Kurz suggests that the temporary unhealthiness of cleared virgin forests is lessened where clearings are effected by burning down the jungles; and that, wasteful as this may appear at first sight, it saves lives and time. The forests on the hills require to be preserved for the sake of water and moisture.—*South of India Observer.*

FORESTRY IN INDIA.

Some eight hundred years ago England was almost covered with forest: now it is difficult to find more than a few acres of wood together. But for this disappearance a very good and satisfactory reason can be given.

It was found that land could be used more profitably in many ways than for growing timber, and as civilization advanced the woods were cleared away, until at last there was not enough to supply the demand, and wood had to be imported from other countries. In this respect, India has been following in the steps of England as fast as she can go, but with this difference, that we in India have not a shadow of the same excuse. Our forest lands have *not* become so valuable as to make such a step a necessity; and yet it is a fact that through bad management and reckless extravagance we were in danger of running short of wood. It is well we are able to say *we're* not in danger; but it may be hoped that the attention of the Government has now been fully directed to the subject and that the impending calamity may be averted. A "Blue-book" has appeared giving an account of all that has been done in the way of forest conservancy up to the end of 1868. This volume will be followed by others which will bring the returns down to a recent date, but enough has been already published to shew that the conservators are in earnest, and if the actual work is carried out with as much care as is shewn in drawing up the report, the results can hardly fail to be satisfactory. This department has had an official existence only during the last ten years or so. Before that time local authorities having no special instructions on which to act, did pretty well as they liked in the matter of forests. Here and there a man might be found alive to the value of timber, but for the most part, there was no check upon its use or abuse; in short the supply was considered inexhaustible and the idea of economizing never seemed to enter anyone's head. The introduction of railways has probably opened people's eyes more than anything else. Wherever a line was made, every bit of available wood was cut as near the spot as possible so as to avoid the expense of carriage. Nothing is better for sleepers than teak, and therefore every teak-tree within a reasonable distance was ruthlessly chopped down without the slightest regard to its age, and as long as these lasted and the other kinds of timber served as fuel for the locomotives all went swimmingly. But the consequences of this penny-wise and pound-foolish policy soon began to shew themselves. The sleepers wore out and the fuel got exhausted and there was nothing to supply the deficiency, but timber brought from a distance at a heavy cost; and the worst of it is that the ground which had thus been robbed of its trees had degenerated in many places into worthless jungle. Now all this might have been avoided if the young trees had been spared and saplings planted to take the place of those which were fit to be felled; but it was nobodys' business to see to this, and no body did see to it until the evil had become so pressing that it could no longer be ignored, of course whatever has been said about railways is equally applicable to the indiscriminate cutting which has been going on for generations for building and other purposes; the first timber to hand was invariably used and the future was left to take care of itself—as to planting forest trees, whoever thought of such a thing? And so the supply was not equal to the demand. It would be absurd to say that the timber in India was all used up; there are of course immense tracts densely covered with forest, but if they are in such inaccessible spots as to make the timber more costly than it would be if imported from Norway or America, they are for all practical purposes, as useless as if they did not exist at all. What we want, and what we ought never to have been without is a sufficient supply of the best kind within easy reach of the most thickly-peopled districts; and this we hope and believe the Forest Department is now bringing once more within our reach by its plantations and nurseries, joined to a well-judged restraint of the unlicensed use of the axe. The wisdom of employing scientific men specially trained for their work is already apparent, and the experience they must be gaining day by day cannot fail to add still further to the efficiency of a staff which must be called an excellent one.

We recommend those who take a real interest in the matter to look through the Blue Book in question, but if information is sought from a more taking source a very good idea to part at least of the Indian forest system may be formed from a book recently published in London of which the author is the late Captain J. Forsyth. It is called "the Highlands of Central India," and, though the production of a veritable sportsman, it contains much valuable information about a district of which little has been known hitherto. He speaks of it in glowing terms as a land of picturesque scenery spacious vallies of wonderful fertility, rivers in plenty and mineral wealth unbounded, wherever there is sterility it might easily be overcome by judicious irrigation. A country possessed of such natural advantages as these will probably play a considerable part in history some day or other; and if not for our own sakes, at least for the sake of posterity we are bound to protect its interests to the best of our power. According to Captain Forsyth the same wanton devastation has been at work in the forests of Goudwana as in other better known districts. The Gou'd is a very bad farmer but a very good woodman: so he fixes (or rather, used to fix) on some likely spot in the recesses of the woods, fells the timber over as large a space as he desires, burns it and mixes the ashes with the earth. This patch he scrapes over, and lives on what he can grow there for a short time; and when the soil shews any symptoms of giving in, he just moves his quarters a little further on and repeats the operation. On the deserted ground there does indeed come up some kind of vegetation, but it is jungle and timber of the poorest kind, and you may look in vain for the much-prized teak tree.

There may be some who think the forest question of comparatively little importance, foreseeing for India a great future through the agency of her coal fields; but even if this were assured to us, it would be folly to waste the riches we have ready to our hand. Instead of receiving timber from abroad, India ought to supply teak enough to build the Navies of the world, and it is little short of a national disgrace for us to be importing railway sleepers from Norway.—*Poona Observer.*

FOREST PLANTING IN INDIA.

We have recently written as strongly as we can on the necessity of legislating for the more effectual preservation and extension of woods and forests all over this country, with the paramount object of increasing and securing the rain-fall, mitigating the severity of the climate, and commanding the sources of our irrigation. In doing so we must not be understood as depreciating the policy of the Government, or the efforts of its officers, to conserve the existing forests and to plant fresh ones. We do not intend in any degree to underrate the work of the Forest Department. From the day that a very humble individual, known to a few perhaps as a cabinet-maker of Madras, suggested the idea of a Forest Department to Mr. Bourdillon, Revenue Secretary to Government, and from the day that that suggestion was taken up, and a special agency inaugurated under the auspices of Dr. Cleghorn, the forest operations have been a clear gain to the State in a pecuniary point of view. But what we would wish to impress upon all interested in the question is that the Forest Department does not appear to have yet fully grasped the importance of its mission in this country. It is not sufficient that a definite additional source of revenue has been created for the advantage of the State, or a respectable and useful means of employment provided for the younger sons of our best families, though neither of these advantages is to be despised in the light of desirable elements in our political economy. The great object should be, over and above money gain, the promotion of rain-fall, with its attendant advantages of atmospheric amelioration and improved fertility of the soil. By keeping this object steadily in view and making it the ruling principle of all planting operations, that direful scourge—famine—may be for ever driven from our doors, and the horrors of wholesale starvation and death prevented, as an inevitable and periodical incident of the laws of nature. It is not in the power of the Forest Department to attain this object by its own unassisted efforts. Our revenue authorities must warmly espouse the common cause, and by their immense local influence and power, both actual and moral, contrive to turn every available spot of waste into plantations of wood. With a rare exception here and there, we fear

that our Collectors and Assistant Collectors are indifferent to the [illegible], their indifference perniciously extends [illegible] the sphere of their influence. One of the most [illegible] in the service of Government is the present Collector of Tinnevelly, and happily for the promotion of the object in view he appears to have a taste for planting. But even he [illegible] to be governed in his efforts for the good of the [illegible] by the grand principle which we urge should be kept in view. A zealous man like Mr. Puckle is apt rather to consider what immediate return he can secure to his employers. Good as this motive may be, he must mix with it the far higher aim of effecting the permanent physical improvement of the province ruled by him. We cannot command the rain to fall at will nor the rivers to run to repletion, neither can we throw a curtain of clouds above our heads to mitigate the rays of the sun; but by slow and steady efforts we can plant the river banks with trees and clothe the mountain sides with wood, which will provoke the dews of heaven, contribute to the supply of every channel and river bed, and diffuse a humidity through the atmosphere favourable to crops as well as to man and beast. We know of no tract of ground on the plains more favourable to arboriculture than the valley of the Tambrapoorny. It is simply teeming with richness. We were once treated to a picnic on an island near the Sutamally anicut, and were astounded with the size and magnificence of the splendid *Marunda*, and the umbrageousness of the *Poongoo* tree. We had also our attention pointed to a waste planted by Mr. Puckle, and it was here, from the character of the trees set, that we imbibed the impression that he was trammelled in his efforts for the improvement of his district by a regard to the immediate gain to be returned to Government for time and outlay expended. And now we learn that he has directed his attention to forest planting with the object of raising a stock of fuel for the purposes of the railway. This is one of the directions in which we apprehend the greatest obstruction to the physical improvement of the country. As fast as the trees grow the railway will burn them, and no advance will be made in increasing the water-supply of the country and the humidity of the atmosphere. Until other substitutes are found for consumption on the railway, we must be prepared with wood-fuel; but it is for the Government to consider whether, in planting trees for this purpose, they should not also consider the policy of planting to a far greater extent than is needed for the limited object in view, and to consider also whether it is not possible to encourage the production of peat in entire substitution of wood-fuel. The tract of country through which the railway is to be extended towards Tinnevelly has been carefully surveyed, and it is found that there is abundance of rich land available for planting all along the banks and *puduggy* lands of the Tambrapoorny and its tributaries, as well as along the several channel banks and on the banks of about 600 river-fed tanks. Hundreds of thousands of the babul, the *Acacia Arabica* and the *Acacia planifrons*, and innumerable seedlings, are already growing all over this tract of country. No difficulty whatever is anticipated in being able to provide sufficient fuel for the railway, if the tracts of ground occupied by the trees and seedlings are fenced in against the depredation of cattle. It is also reported that, with the view of supplementing the indigenous growth, nurseries can easily be formed in various trenches and pits. On six acres of land on the left bank of the Chitravathy river, about a quarter of a mile from the village of Sivilipari, there are now standing about 300 to 400 babul trees besides a thousand seedlings. On about sixty acres near the same village, but on the left bank of the Tambrapoorny, there are about 7,000 to 8,000 babul trees said to be among the finest of the kind, while innumerable seedlings are growing up all round. On a tank-bed near the village of Kalliyoor, on about seventy acres of ground, there are about 15,000 babul trees besides a host of seedlings springing up all of themselves. Near this village also there is a spot of 150 acres, extending from the anicut along the river and channel banks to the village of Vallanad, containing about 60,000 trees. This spot is described to be a magnificent tract of jungle, capable of extension by planting and sowing. Other tracts are also described as available, with a number of trees now growing on them. Altogether we find that at present, without a rupee being laid out on the work of improvement, there are no less than a lakh of trees and more growing of their own accord, as it were, on about 441 acres of ground. Why should all this fertility go to waste? In the olden days pious Hindoos of means—it might have been by way of "conscience money"—dug wells and tanks and planted clumps of trees around them for the comfort and solace of weary travellers. All these refreshing objects of sight and sense have been allowed to pass away, and the consequence is that the very face of nature has almost been changed. Every nook and every cranny, the banks of every stream and rivulet, the sides of every irrigating channel, every hollow and every ditch, should be sown broadcast, or fire-cast with seedlings. Trees of every kind should be grown, profitable and unprofitable as to their products, and all Departments should unite—Forest, Revenue, Public Works, and Police—in raising vegetation wherever it can be raised. We will very soon have the face of nature smiling upon us even in this tropical climate. Tanks and channels, and the primitive pickotah where the level of the water is below the land to be irrigated, will be grand auxiliaries in carrying out the benefits of physical improvement. It may seem superfluous to urge so warmly the necessity of planting forests, and thus encouraging the rain-fall in a country where the want of water is so great as to be palpable to the most superficial observer, and where a tank or a well is fought for as though it were a mine of diamonds. We fear however that the natural results of climate on overtaxed man prevent those, who would otherwise devote themselves to the physical improvement of the country in which their lot is cast, from espousing the good cause we are so strongly advocating. The Indian official overworked, worried, and in a constant state of nerve and brain tension, is too apt to fall into what we may fairly call the *laisser aller* style of public duty, and give way too readily to the eternal *adhi* (*Anglice*, to-morrow) with which the native of the country constantly meets any demand on his time or labour. It is not easy to find men of the intellectual vigour and physical strength that is needed to carry out a task like this. Still we need not despair in the cause of proper forests planting, when we find that pisciculture has its energetic apostle in Henry Sullivan Thomas, and archæology its martyr in the much-lamented John Alexander Corrie Boswell, who has just died on a visit to England; but we would rather hope that when the minds of our public officials are thoroughly imbued with the magnitude of the principle to which we feel we have but too feebly referred, even so vast a scheme as the re-planting of Southern India will not long lack champions, earnestly to co-operate with each other in developing one of the greatest sources of material wealth, prosperity, and comfort in this wide and sunny land.—*Madras Revenue Register.*

ARBORICULTURE.

THE Collector of Salem has kindly chosen to give to the public certain hints on pruning trees. As a rule, Mr. Longley states, all deciduous trees should be pruned when leafless. In India, different trees, winter and summer, at different times, but as a rule the hot weather is the best for pruning. 1. Never cut clean from the ball of a tree a branch which is more than 4 in. in diameter at base, and of this size only, if the tree is large and in full health. 2. Shorten all the large branches that have the appearance of gaining on the leading shoot of the tree; of these branches from ½ to ¾ should be allowed to remain. 3. Trees should be pruned when the wood is full of sap. 4. When after some considerable time has elapsed, the remnants of the shortened branches have thrown out young shoots, these remnants should be removed close to the stem. 5. When a number of branches spring from close to the ground, and it is difficult to fix on one as the main branch, the only plan is to cut the main stem by the surface of the ground, and allow a new set of shoots to rise up. The chances are that all the new shoots will rise in an upright position, and then a choice can be made. 6. In cutting off any branch of a tree from its stem with the pruning knife, take hold of the branch with the left hand a little forward from the base, ease it upwards and at the same time apply the knife to the base of the branch, cutting upwards, parallel to the stem. Care must be taken, when the branch is to be entirely removed, not to enter the knife upon the plane of the stem, but a little,—say ¼ in. above, the base of the branch to be cut off. By this means the stem of the tree is not injured, and the damp is thrown off the wounded part. In cutting off whole branches from the stem of a tree, the wounded part should be made perfectly smooth, paring it neatly all round with the knife which should be kept very sharp. Care should be taken to cut *upwards*, not downwards, to avoid tearing the bark.—*Madras Standard.*

Official Gazette.

BOMBAY, 21ST MARCH 1872.

SEASON REPORTS, FEBRUARY 1872.

GENERAL REMARKS.—Except in Assam and Eastern Bengal, and setting aside some scattered showers in a few other places, the fortnight has been one of fair weather. The spring crops are harvested or rapidly approaching ripeness, and on the whole their out-turn is likely to be satisfactory. In certain districts of Bombay and in the Berars the shortness in fall has however resulted in a bad harvest. In the Northern Coast districts of Madras and that portion of Orissa bordering on the Chilka Lake some distress is anticipated, but measures have been taken to provide relief, and neither in the price of food or in the public health is there any sign that any dearth exists. Steps have been taken to meet the possibility of distress in Bhairwara also.

Presidency or Province	District	Date of Distress Return	Relief [illegible] overnight [illegible]	Date of [illegible] from Government or Administration	State of Agricultural prospects	Remarks [illegible] Government or Administration
Madras	Ganjam	February 29	[illegible]	March 1	Slight rain in some places on the 22nd and 23rd prices slightly fallen health good on the whole cattle disease prevails.	Prospects in the Northern Coast districts remain unchanged relief measures are extending Elsewhere the condition of things is satisfactory
	Vizagapatam	" 28	Nil	February 29	Drinking water failing, prices unchanged, market well supplied by importation health good.	
	Godavery	" 28	Nil	"	Market well supplied prices steady health good	
	Krishna	" 28	Nil	"	Prices steady markets well-supplied health and prospects good	
	Karnool	" 28	Nil		Prices steady markets well-supplied health good [illegible] present	
	Nagapattam	" 28	Nil	[illegible]	Prices [illegible] prospects fair	
	Trichinopoly	" 28	Slight [illegible]		Prices [illegible] in fairly good order harvest [illegible]	
	Calicut	"	Nil		Prices [illegible] health fairly good	
Bombay and Sindh	Kurrachee	February 28	Nil	February 29	[illegible] Shah [illegible] pickings over	
	Guzarat				Rabi [illegible] cotton [illegible]	
	Ahmedabad	"		"	[illegible]	
	Kaira	"		"	Large crops [illegible] cotton, good, [illegible]	
	Surat	"		"	The [illegible] of cotton crop picked out [illegible] late crop picked up a good deal	
	Khandesh	"			Grain and cotton prospects unfavorable	
	Poona	"	Nil	"	Harvest already reaped cotton crops [illegible]	
	Satara	"		"	All late crops laid, reaping nearly over [illegible] ton picking begun	
	Ahmednagar	"		"	No rain	
	Dharwar	"		"	Late [illegible] reaped cotton picking in progress	
Bengal	Presidency Division			"	Weather fine and clear prospects of crops good.	
	Dacca Division			"	Cloudy and rainy, than fair and dry, crops promise well.	
	Chittagong Division			"	Weather fine crops good.	
	Cuttack Division			"	Weather in Puri windy and variable, but no rain crops excellent in Cuttack and Balasor in Puri generally satisfactory relief works in operation in the distressed tracts in the Chilka Isthmus.	
	Chota Nagpore Division			"	Weather fine, crops favourable.	
	Bhagalpore Division		Nil	February 28	Weather favourable prospects of crops excellent.	
	Sonthal Pergunnahs		Nil	"	Weather hot and dry, wheat and gram doing well, sugar-cane sowings getting on favourably	
	Patna Division		Nil	"	Weather fine wheat and barley generally good pulses have suffered somewhat from the late rains.	
	Rajshahy "		Nil	"	Weather fair and seasonable, crops generally good, in Dinajpur mustard scarce for want of rain.	
	Burdwan "		Nil	"	Weather getting hot, crops doing well; in Howrah spring crops somewhat damaged by hailstorm of the 20th	
	Assam "		Nil	"	Weather stormy and cloudy, crops satisfactory	
	Kuch-Behar Division		Nil	"	Weather seasonable; almost all crops reaped; those remaining are good.	

N.-W. Provinces			...	February 29	No rain at any of the reporting stations during the fortnight, prospects of the harvest good.	
Punjab	Delhi	February 29	Nil	"	Crops good, weather variable.	Agricultural prospects generally similar before.
	Umbala	"		"	Agricultural prospects good.	
	Jullundhur	"		"		
	Lahore	"		"	Heavy fall last night at Lahore itself, none in district in previous fortnight	
	Multan	"	Nil	"	Rain wanted, gram crops greatly damaged, and wheat crops slightly, by insects in Sarai Sidhu.	
	Rawul Pindee	"	1	"	Agricultural prospects good.	
	Peshawur	"	1		Ditto ditto	
Oudh	Lucknow	February 25	Nil	February 25	The fall of rain and fogs have proved injurious to the crops, but present westerly winds are doing good; prospects favourable	
	Fatzabad	"	Nil			
Central Provinces	Jubbulpore	"	Nil		Prospects of crops good throughout the division, in parts of the Jabalpur District the wheat has been attacked by "Girva," but very trifling damage has been done as yet.	
	Nagpore	"	Nil	"	Rubbee crops reaped in most places, prices steady	
	Wardha	"	Nil		All crops, except opium, harvested, quality good, but quantity short.	
	Hoshangabad		Nil	"	Wheat suffering, gram good.	
	Chindwara and Betul	"	"	"	Rubbee being cut yield average, and three-fourths of an average respectively	
	Nimar		Nil	"	Khurreef below the average, rubbee not favourable, wheat and gram being harvested	
	Kurungpore	"	Nil	"	Crops favourable might be better	
	Raipore	February 26	Nil	"	Cloudy, wheat two-thirds of an average crop expected; pulse crops gathered, yield average, oilseeds three-fourths of an average.	
	Belaspur		Nil		Three-fourths of an average rubbee crop expected, oilseeds have suffered considerably	
	Sambalpur				No change	
Hyderabad Assigned Districts	East Berar	February 28	Nil	February 28	Spring crops mostly harvested, out-turn less than usual average want of water increasing, health good	
	West Berar	"			Harvest now over, want of water and fodder for cattle is increasing	
	Sirohi	February 17		February 28	Same as last report.	
	Meywar		Nil		Water becoming very scarce, prospects very poor, crops being parched up.	
Rajputana	Marwar	"	Nil	"	Water supply good prospects fair	
	Deoly	"	Nil	"	Prospects continue good.	
	Kotah and Jhalawar					
	Jaipur		Nil		Water supply average, prospects good	
	Ajmir and Mhairwara	"	Nil		In Ajmir, water supply tolerable, spring crops healthy; in Mhairwara tanks empty rubbee prospects very poor measures adopted to prevent distress	
[illegible]	Western Malwa	February 28		March 1.	No change since last report.	
	Baghelkhand	"			No rain during the last fortnight, prospects of crops very good.	
	Bangalore	"		February 28	In a few places the Bengal gram crop is blighted, and the sugar-cane crop is withering from want of water both are being harvested, the hot-weather paddy crop is progressing satisfactorily	No material change in the prices of grain since last report.
Madras	Mysore	28	Nil	"	Sugar-cane, cotton and castor-oil seed are thriving.	
	Coorg	28	Nil	"	Threshing of paddy crops nearly completed; fields being ploughed and manured in North Kurg, gram crops thriving picking of coffee completed, and almost all exported.	

The Planters' Gazette.

BOMBAY, 21st March 1872.

THE ESTATES.

We are glad to learn from a Ceylon paper that the leaf-disease is disappearing from the coffee-plants. It says :—" Leaf-disease has but a slight effect on coffee generally, and is disappearing. The weather is favourable and the prospects of crop are very good. The blossom now appearing on the native coffee is almost unprecedentedly fine."

The quality of last year's Plantation Coffee, sent to the London market, with "Coonoor" and "Neilgherry" marks is spoken of in *Messrs. Patry and Pasteur's Annual Price Current*, as having been superior to the generality of Wynaad coffee; the inferior quality of the latter being attributed to exceptional circumstances, such as unfavourable weather for picking, and the setting in of the monsoon on the Malabar Coast. Fortunately, remarks the *South of India Observer*, the demand for coffee at home, has been good for almost all kinds, and high prices have been realized.

The Committee of the Planters' Association has resolved to prepare a memorial to the Chancellor of the Exchequer praying for the abolition of the present Imperial duty on coffee. Coffee is *not* the magnificent investment it was once supposed to be. A correspondent of the *Madras Mail* recently advised us to stick to Government paper at four per cent., rather than trust to schemes which offer 10 to 15, or 20 per cent. on the venture. Indeed, it has been a miserable business for most engaged in planting, and it is the requirement of plain justice to suspend all taxation thereof. In advocating the abolition of the present tax on coffee, the *Ceylon Observer* remarks :—

Unfortunately for coffee planters, the staple drink of the English people is not a decoction of the fragrant berry which is so universally popular with the Dane; the rate of consumption of coffee at Copenhagen being thirteen pounds per head of the population per annum, while in England the rate per head is *not* more than a fraction over a pound of Coffee, and about four pounds of tea. Well would it be for English working men if they were induced to substitute coffee and tea in place of the beer and gin of which so great a quantity is consumed by them. One means of helping a movement towards this end which is now engaging so much of the attention of philanthropists and public men generally in England, will undoubtedly be found in lessening or removing burdens which interfere with "a free breakfast table;" and the arguments used by Herr Ulstrup in the Danish House of Commons may well be reiterated, although from less disinterested motives, by the Planters' Association of Ceylon in praying for the abolition of the tax on coffee, and for stringent regulations against adult ration. Any means of promoting the sobriety of the working classes of Britain claim the attention of statesmen at the present moment, and the great difference between the English workman and his continental *confrere* in this respect, is that beer and gin are to the one what coffee is to the other. There cannot be much to commend to the House of Commons a tax so insignificant in its actual production in comparison with the expense of collection as that on coffee; is

ANNUAL TEA REPORT.

1871 has been satisfactory, inasmuch as the deliveries show an unprecedented increase, on the one hand proving the elasticity of consumption consequent upon a low rate of duty, and on the other reassuring to those who feared that our export trade would decline owing to the direct communication by steamers now established between Russia and China. The result to importers threatened at one time to be serious, for not only was the system of hurrying forward the new crop by the Suez Canal carried to a dangerous extent, but much higher prices were paid in China than the quality warranted, and as a natural sequence, under the pressure to realize, some sharp losses were at first experienced. Subsequently the unexpected large demand helped to support the market, and has secured for the bulk of the imports a profit in place of the loss which before seemed imminent; while of late a belief that the total export from China will not reach the figures at one time anticipated has also tended to confidence. The large deliveries of last year will probably lead to a speculative market in Chinas for the coming season, and sanguine buyers may argue that, as stocks will be so much reduced, a generally high range in price must follow. The late large deliveries, we consider, has only placed tea in the position of a healthy trade. Looking to the present course of commerce, and so long as supplies keep pace with the current demand, there is every reason why rates should not advance. The home consumption has doubtless been stimulated by the low retail price, and any change in this direction would at once operate as a check to the present favourable statistics. It also must be remembered that the export from India will increase, while the general improvement in quality enables the dealers to mix most advantageously. The total deliveries were 163¾ millions, showing an increase of over five millions in home consumption, and ten millions in export. The stock was three-and-a-half millions above that of last year. A marked improvement in the manufacture of Indian teas, continues to be developed, and many gardens that were noted for inferior produce now rank among the best. It may be fairly said that the ignorance and folly, which unhappily in too many cases mark some of the early undertakings, have been succeeded by industry, science, and skill, so that tea now promises to become one of the soundest staples of growth in India. It is increasing in favour with the public, and must continue to do so for all the full and strong qualities. The imports into the United Kingdom have been 167,250,000 lbs. against 140,600,000 lbs. in 1870; the deliveries for home consumption 123,000,000lbs. against 117,750,000 lbs. in 1870, the deliveries for exportation 40,750,000 lbs. against 30,750,000 lbs. in 1870; the stock remaining on the 31st of December was 83,250,000 lbs. against 79,750,000 lbs. in 1870.—*British Trade Journal.*

IPECACUANHA.

BENGAL.

The Government of Bengal is engaged upon the prosecution of one of those enterprises the results of which besides benefiting this country, are likely to extend themselves over the whole civilized world. It is no secret of trade that the sources from which the Ipecacuanha plant is obtained from the forests of Brazil, are failing fast, owing to the wanton destruction which has been going on for a long time, and the medical faculty have long been conscious of the impending calamity, the nature of which can be estimated only by those who are acquainted with the invaluable uses to which the principle of the plant is applied in the treatment of disease. Some four years ago, a representation was made by the head of the Indian Medical Department in Bengal to the Government of India, in which the advantages likely to follow the successful cultivation of the Ipecacuanha plant on the Darjeeling slopes were set forth with great earnestness and force. On the proposals being referred to Dr. Anderson, then Superintendent of the Calcutta Botanical Gardens, they met with his heartiest support, and a spot in the Sikkim terai was pointed out by him as most eligible for trying the experiment. These recommendations were approved by the Government of India, and shortly afterwards Dr. Anderson, proceeding to England for the benefit of his health, entered into personal communication with the Secretary of State for India and the Directors of the Royal Botanical Gardens, Kew and Edinburg, for the selection of a suitable number of plants for trial in India. The death of Dr. Anderson, by which a great loss was sustained by the scientific world, prevented him from having any further share in the prosecution of this undertaking. Lately a batch of upwards of two hundred Ipecacuanha plants has been received from the Botanical Gardens in Edinburgh, and they have been made over to Dr. King, the present Superintendent of the Botanical Gardens, Calcutta. It is understood that they are to be planted out in Sikkim, and when sufficiently grown they will be transferred to other localities in order to test the circumstances of soil and temperature which are most conducive to their vigorous growth. It is to be hoped that the experiment upon which the Lieutenant-Governor has fully set his mind, will justify the anticipations which have been formed in respect of it.—*Indian Examiner.*

CINCHONA.

CINCHONAS IN INDIA.

We understand that the Travancore cinchonas are a failure. Planted in laterite, their roots become water-logged, the bark peels off, and the plant dies. Certainly there is no tree grown which is more impatient of moisture at its roots than the *Succirubra*. Mr. Cross, writing of the *Pitayo* bark trees, describes them as clinging to the sides of hills, growing anywhere, in fact, where the drainage was perfect.—*South of India Observer.*

CINCHONA IN MYSORE.

From an analysis by Mr. J. Broughton, Government Quinologist, of cinchona bark, grown on the Billigiri Rungum Hills, Mysore, it appears that the bark was of good appearance, and consisted entirely of that of *C. Succirubra*. Its analysis gave in

[illegible] total alkaloids 7·60 per cent., quinine [illegible] and cinchonine 6·40 per cent., pure [illegible] 1·60 per cent., other salts [illegible] per cent. The bark is of high quality for C. Succirubra, [illegible] compares with that of the Nuligherry Plantations. It combines both the defects and the excellencies of Indian red bark.—*Madras Mail.*

CINCHONA IN TRAVANCORE.

Having recently made an inspection of the Peermede Cinchona Plantations, Travancore, Mr. McIvor regrets to state that he found the plants very seriously affected with disease. As he is unable to suggest a remedy, he thinks it advisable that all the diseased plants be at once cut down, and the bark removed and despatched to Europe for sale. He has brought away numerous specimens of the roots and diseased parts of the plant, and so soon as he is able to complete a careful examination of these, he will submit a detailed report on the subject to Government. Any delay in securing the bark will seriously affect its value, as the bark of trees which are allowed to decay and dry up becomes of no value; therefore, the sooner the bark is removed the better. There are about two-thirds of the entire number of trees on the Peermede Plantations so seriously affected with disease, that it appears to him advisable they should be at once cut down and barked.—*Madras Mail.*

SALE OF CINCHONA BARK.

The Right Hon'ble the Secretary of State for India wrote as follows to the Right Hon'ble the Governor of Madras with regard to cinchona bark:—With reference to your Excellency's despatch dated 21st August (No.30) 1871, reporting the transmission by the Suez Canal of 3,188½lbs. of cinchona bark for sale in the London market, I have now to inform you that the bark was sold in the ordinary way with other lots from South America on the 22nd of last December, without any reserve price. The prices obtained at the sale are satisfactory, ranging from 2*s.* 1*d.* to 2*s.* 10*d.* the pound. The highest prices were fetched by the unmossed Succirubra and the unmossed Condaminea barks, which reached to 2*s.* 9*d.* and 2*s.* 10*d.* the pound. The old mossed Succirubra only sold for 2*s.* 3*d.* the pound.—*Madras Times.*

CINCHONA IN THE N. W. PROVINCES.

In November last, Dr. Jameson, Superintendent of the Botanical Gardens, N. W. P., visited Ranikhet with a view to ascertain its capabilities for cinchona cultivation. The soil he found light and free, the natural drainage everywhere admirable, and the prospects of the proposed experiment generally very encouraging, provided that the frost was not severe. There are now at Ayarlotie about 800 healthy young plants which will be planted out in selected sites next March, some 200 others being at the same time made over to Colonel Ramsay for distribution among the local zemindars. The experiment of cinchona plantation has already been tried in the Kangra Valley, where it was a failure; but Dr. Jameson, believing that a series of experiments on a small scale but extended over several sites may prove successful, on these grounds has asked for an extension of the experiment for another eighteen months. This request has been complied with by the Local Government, which considers that the experiment ought without doubt to be prosecuted until the question, a very important one for the poor, is finally settled either *pro* or *con.*—*Pioneer.*

CINCHONA PLANTING.

Mr. R. B. Elwin applied last year to Mr. MacIvor, the Superintendent of the Government Cinchona Plantations, for 5,000 plants for his estate, the "Mary Ellen," in the Wynaad. He was charged one anna per plant for that lot. Mr. Elwin applied for another 5,000 this year, but at the same time remarked that the high price charged for the first lot materially restricted his operations and he gave it as his opinion that unless Government were prepared to supply plants at a nominal cost, cinchona planting in the Wynaad will continue to be on a very limited scale. Mr. McIvor in forwarding the letter to the Commissioner of the Nellgherries, suggested that the charge should be reduced to six pies both for last year's supply and for this. As plants can now, Mr. McIvor says, "be cheaply and abundantly produced," and the Secretary of State has lately expressed his desire that cinchona cultivation should be encouraged in Wynaad, the Commissioner has suggested to Government that the price be not more than two pies a plant for all the common varieties of which the Government plantations possess abundance. Mr. Brooks has also requested the sanction of Government to give orders to the Superintendent that in future no plant leave the Government estates until the pice, at the rate of two pies each, has been received. Government have approved of the Commissioner's proposals.—*Daily News.*

TEA.

THE PUNJAB HILL TEA.

It is stated that the Punjab Hill Tea is coming into vogue in Bokhara and Cabul, the people of those countries having begun to prefer it to the China tea either imported through Bokhara or India. It is also stated, with what amount of accuracy is not known, that the Cabul merchants have instructed their agents to buy up the Hill Tea sent by the planters to Amritsur.—*Times of India.*

THE BRITISH-INDIAN TEA COMPANY.

The following is from the half-yearly report of the Directors, to be presented at the meeting on January 20:—

The directors have to report to the shareholders that the crop of tea of 1871 has yielded about 280,000 lbs., being an increase of nearly 20,000 lbs. on the previous year. Final weights of the crop have not yet come to hand. The falling off, as compared with the estimate given in July last, is chiefly owing to deficient yield in the garden at Minnipore. The quantity arrived to date is 221,000 lbs., of which 189,000 lbs. have been sold at an average of 1*s.* 0½*d.* per lb. gross, or 1*s.* 7½*d.* per lb. net. If the remainder of the crop realises only 1*s.* 6*d.* per lb. net, the total value of the teas of the past season will be about 22,000*l.*, against an outlay which, it is believed, will not exceed 18,000*l.*, leaving a surplus on the season's operations of about 4,000*l.* Messrs. Jardine, Skinner, & Co.'s claim has been paid off with interest, and there are no new liabilities, except those arising from current operations, which the crop of tea will more than cover, so that practically the company has no liabilities except to its own debenture stock-holders, and the properties are entirely without encumbrance. The books of the company for the past six months have been audited by Dr. Tripe and found correct, and the accounts of the season will, as usual, be presented at the annual meeting in July. In conclusion, the directors feel they may congratulate the shareholders on the improved condition and hopeful prospects of the company, and they trust at the annual meeting, that the accounts to be then presented will fully substantiate the estimate they have given in this report of the result of the past year's operations.—*The Overland Mail.*

INDIAN TEAS.

Mr. Alexander Campbell, late of Assam, who served as a juror on articles of food in the London International Exhibition of 1862, and exhibited all the Indian teas on that occasion, remarks in a letter to a London paper that his collection consisted of about 150 specimens of green and black teas from the tea-growing districts of India, viz., Assam, Cachar, Darjeeling, Kumaon, Dehra Dhoon, Kangra, and Chota Nagpore. "These teas attracted great attention from their novelty as an Indian product, and from the perfect manner of their manufacture, I was constantly interrogated by visitors to the Exhibition about their quality, price, the mode of manufacture and cultivation, and especially as to their economy in use compared to China teas. They were also highly approved by the jurors and other persons who had opportunities of drinking them, and the result was the award of medals and honourable mentions to eight or ten of the manufacturers. So far, something was done to bring this new article of food, which is of the purest and best kind, to the notice of the British public, through the intervention of the International Exhibition, but it was very inadequate to the wants of the public in general, who had no better means of judging of these teas than admiring them in a glass-case. What I propose for the consideration of the Food Committee is that, at the Exhibition of 1872, the public should have the opportunity of drinking Indian teas as well as looking at them, that intending exhibitors should be informed of this opportunity, and invited to send sufficiently large samples of the teas to admit of this being done without much cost to the Society of Arts. From my experience on the last occasion, I feel very sure that the tea-planters and tea-companies who desire to exhibit will respond liberally to this invitation. In 1862, large samples—20 lbs. in some instances—were sent to me, and went eventually to the India Office, as the Indian Government had provided free carriage for them from India. On that occasion, I believe that the exhibits represented no more than a crop of a million pounds for all India. It will be very different in 1873, as I have good reason to believe that more than 20 millions of pounds will be the out-turn of this season (1871).—*Madras Mail.*

INDIAN TEAS.

The Madras Agri-Horticultural Society, at their recent exhibition, not only gave prizes for the best flowers, rare plants, and vegetables, but also to the producers of the best tea, tobacco, Carolina rice, Indian-corn, cotton, and silk. Four competitors, we are told, sent specimens of tea. The prize for the best was awarded to the Curson Estate at Kotagherry on the Neilgherry Hills. This specimen excelled in manipulation, aroma, as well as

the quality of the leaf. We are glad to notice that everywhere the improved quality of the Indian teas is remarked upon and confidence in their quality is more relied on by the dealer. The *Produce Markets' Review* tells us that the consumption of Indian teas has been somewhat checked by the high prices which have ruled throughout the past year, *the supply having barely kept pace with the increasing demand.* This however is regarded as only temporary, as with the present highly remunerative scale of prices, cultivation is sure to be largely increased, and as the Indian growth continues to advance in popularity, a regularly and extensive demand may be relied on. It is certain that as the quality of the Indian teas is known and appreciated, the demand will go on increasing. The accounts which we continue to receive from all the tea plantations in India are most encouraging. The *Pioneer* tells us that their prospects are brightening in the North-West Provinces and that prices varying from two shillings and two pence to upwards of three shillings had been given for tea from the Western Dhoon. The progress of the industry in Darjeeling in 1871 has been most satisfactory—the increase in the quantity and quality of the season's crops having been marked and steady. The rapidly increasing employment of machinery in tea houses has been regarded as significant of the permanent character of the investments made by the dealers. The truth is, that everywhere a knowledge of the advantages and disadvantages of engaging in tea cultivation are becoming fully known, and the days of wild speculation have passed away. Men undertake the work as the business of their life and steadily set themselves to the task of making themselves comfortable, while they strive to make their work remunerative. Greater skill has also been acquired in the perfecting of the growth of the plant. Pruning, manuring, and tillage are becoming scientific operations. The great difficulty now is to get native workman to understand the work, especially the work of pruning—the kind of stems and branches they are to remove; and, as Dr. King says, it will require much ingenuity and care and incessant watchfulness on the part of the manager to keep them from doing harm. As is the case with other matters, he says, it is infinitely easier to prune badly than to prune well; but there are few operations where the different results between good and bad work is more striking. In order to prune really well, each clump ought to be treated on its own merits; but as it is pretty nearly hopeless to think of getting native workmen who are capable of doing this, it would be necessary for the manager (after having clearly defined to himself what it is that he wants to effect and the best way of doing it) to give his pruners a general idea of the kind of measures suitable for each patch of tea in the garden as they come to go over it, illustrating to them practically what kind of stems and branches should be cut quite away, what kind should be merely trimmed, and what left entirely untouched. We should think that such delicate work should always be performed under the eye of the manager, and no part of it left to the discretion of his native workmen. The English farmer never trusts even English workmen to execute difficult parts of the work on an English farm. We see the master present at the manuring, sowing, and even ploughing of the fields. No one ought to engage in either farming or tea planting who is not prepared to do regular work and to take the entire superintendence of all that goes on in his farm or plantation. A young man, possessed of a little capital, asked us the other day what we thought of his prospects if he embarked his capital in the purchase of a tea plantation. We answered candidly that we thought very badly of them. He had not the energy and application necessary for carrying on farming at home, so we felt sure that his undertaking plantation-work in India would only lead to utter failure. The qualities requisite to ensure success in land cultivation at home are the very qualities necessary to secure success in the same work in India.—*Deccan Herald.*

UPPER INDIA TEAS.

(To the Editor of the Delhi Gazette.)

I RECENTLY noticed, with much satisfaction, some very *apropos* observations from your own pen on the disadvantages under which the tea-planters of India (by whom as I take it, you more especially mean those gentlemen possessing or managing tea plantations in Kumaon, the Dehra Dhoon, and the Kangra valley) labour in not being effectively represented in England, and I am entirely of your opinion that it is even more serious than it appears at the present moment to be.

No doubt many of these gentlemen now find a fair, perhaps a ready market for their produce in India, but if they continue to thrive in proportion to their existing prospects and expectations, they will soon find that the supplies they are rearing are becoming greater than the local demand, and that they must submit to a fall in their prices, or look out for other and more profitable markets. That such can be found only in England is beyond a doubt.

But unless the planters take time by the forelock and at once look about them to secure not only a market at all, but a good market, they will find themselves strangely adrift when necessity will compel them to look westward for customers.

I am afraid your half-jocular half-earnest suggestion as to aid from official quarters in this country is not likely to turn out to any advantage. So careless is the Secretary of State for the commercial wants and prosperity of India, that he has actually not only ignored a strongly-manifested opinion of the House of Commons, that he ought to have some one conversant with mercantile affairs in his Council, but has preferred to take a lawyer to assist in riding to death the legislative horse of India, already so sorely overworked. The old adage *A mule not a Dieu l'aidera*, is thoroughly applicable to the case in point. Let all the planters put their shoulders vigorously to the wheel, let them unite, make some joint movement, and look about for some house of business of good standing in London that would suit their purpose and be prepared to make, not only reasonable advances on their produce in India, but to look after it when it arrives in England, taking measures to make it thoroughly known both to the trade and to the public at large, pointing out to the planters what course they should follow to make their wares more acceptable in flavour and appearance.

These are points at present totally ignored by the two or three individual agents who do receive small consignments. All that is required of them in their opinion, is to make over the tea to the broker, prepare account sales, and draw their commission.

If those I address, through your columns, are inclined to adopt my recommendation, I feel quite assured that, commencing with small but well-selected consignments, supported by such an active Agency as I suggest, they would, within a very few years find themselves in a condition to ship not only a large proportion, but the bulk of their teas to London on highly advantageous terms, and still retain enough for Indian consumption.

The facilities offered for transporting merchandize to the seaboard are increasing every day, and I am certain that if the railway Companies found it to their interest to promote a growing export of tea, they would hasten to meet the requirements of the planters by lowering the rate of carriage to considerably less than now rules. The eastern provinces of Cachar, Sylhet, and Assam, now export their teas by millions of pounds, and there is no reason why the North-West Provinces and the Punjab should not do the same, if they will only adopt proper means.

But unity and fixity of purpose are indispensably required at least for a commencement and the establishment of one great Upper India Tea Agency in London would be attended with signal success, while the nomination of separate agencies with a variety of conflicting interests would do more harm than good. I can hardly ask you to give more than a reasonable portion of your space to matters of this kind, involving special mercantile interests, but the amount of capital at stake is very considerable, and growing every day, the prosperity of a large branch of industry is in question, and I therefore venture to ask you to say a few words in support of my proposition (an offshoot of your own) that joint action on the part of the Upper Indian tea-planters, to whom I more specially allude, would lead to highly satisfactory results. There is or was a Kangra Valley Planters' Association. If still in existence it might take action in this matter, place itself in communication with the gentlemen of Dehra Doon and Kumaon, and come to some well-defined resolution in promotion of the future well-being of all concerned.

Your article has been copied largely, and has no doubt attracted attention.

London, 5th January 1872. * * * * *

TEA CULTIVATION.

More pressing matter having occupied our space during the last month, we have been obliged to discontinue our *resume* of Dr. King's remarks on the pruning of tea. Our last article on the subject showed the injury the plant received from indiscriminate plucking, which causes the leaves to increase out of proportion to their means of nourishment, the stem not having increased proportionately to the number of leaves which the plucking has forced into existence. Were plucking to be discontinued for a time, the stem might recover strength to transmit sufficient sap for the support of the young leaves. This however would involve time and retard the "flushes." The planters therefore prune off the old sprays crowded with leaves too old to be made into tea, although they drain a certain quantity of sap from the stem; and thereby deprive the new shoots of the necessary amount of nourishment. Without incessant care and watchfulness on the part of the manager, ignorant workmen may do infinite damage in a garden. Each clump requires its own peculiar treatment, and the pruning necessary to produce a fine succession of healthy flushes on one set of plants would irretrievably ruin others. One plan only is applicable to all, *that old wood is to be cut away within a few inches from the root*, as this wood rarely bears good leaves, and when cut low down, fresh new shoots may spring from the root and absorb the sap formerly wasted upon the worthless broom-bearing sprays. Sometimes this may be spared to carry on the collection and transmission of the sap for the benefit of the young shoots, which will appear when the old wood is cut down. When a plant is vigorously pruned there is always a

possibility of [illegible] before it can recover sufficient vitality to [illegible] its strength, for this reason it [illegible] and not be wholly dependent upon the [illegible] plants should be very tenderly [illegible] the well-matured the soil round them so as to [illegible] better condition, then prune them lightly and [illegible] weather cut down to the root. This [illegible] that there is time enough to proceed carefully with the plants; where money is an object, time must be sacrificed. Useless stems may be easily recognized by the appearance of their bark being lichen-grown and always grey-[illegible] while young healthy stems are of a brownish colour and [illegible] with dark lines. The suckers springing from the [illegible] the plant and should be removed. The clumps should not be too close to each other, but light and air should have free access to the centre. Pruning should be carried on when the plant is at rest, and although a time must come when it will cease to bear the fresh demands on its strength, with careful treatment plants may bear profitably for 15 or 20 years or even more, yet this does not obviate the necessity for laying down each year fresh bushes. It appears to us that the principles of good gardening are applicable to tea planting, and the same means which we use to bring our gardens to perfection—manuring, weeding, and hoeing—will have an equally beneficial effect upon tea bushes. Let once good seed be obtained, and the plan of operations detailed in Dr. King's pamphlet, though requiring watchfulness and industry, will not fail of success.—*Bengal Times.*

TEA PLANTING ON THE NEILGHERRIES, PAST AND PRESENT.

More than twenty years have elapsed since the tea plant was first introduced on these hills; and although the results hitherto obtained are small in comparison with the amount of capital and labour expended, there is little doubt but that tea planting, properly conducted, will prove a success. All our large tea districts have risen to their present degree of importance and prosperity from small beginnings. Their rise has certainly been more rapid; but they have had at the same time, greater difficulties to encounter and overcome, ere tea planting could, in any one of them be pronounced a financial success. Their greatest trial perhaps, was the rush of reckless speculation, which took place between 1863 and 1865, and ended in the hopeless break-up of many large concerns. In the year above-mentioned, Joint Stock Companies were formed for the purchase of gardens,—no matter how badly they were laid out,—at fabulous prices; and when purchased, these same gardens were worked regardless of expense. Any man was then considered competent to manage the tea estate,—no matter if he were wholly unacquainted with the business, or how questionable his antecedents might have been. Very few years sufficed to show that a share in one of these gardens was not the sure foundation of a fortune that many had believed it to be: and the gardens themselves were sold and re-sold at a considerable loss. With the exception of a few cases, in which the purchase money was exorbitant, these gardens are now paying a dividend; and, in the hands of experienced managers, are not only becoming a source of profit to the owners, but also to the revenues of the country. The greatest successes however have been achieved in private undertakings; but as the returns of these gardens are never made public, nor their dividends honoured with a place in the share lists, the real advantages to be gained from the enterprise are known only to the planters themselves. It is hardly necessary to re-capitulate here all the difficulties and turns of good and ill fortune which have befallen Assam and Cachar, from the outset of tea-planting down to the present time; but this much may be said, that districts which are now well-populated with a fair area of cultivation, were, but a few years back, wastes of grass and tangled jungle; that labour, in our acceptation of the word, was wholly wanting; the climate previous to the clearings made in the formation of tea estates, malarious in the extreme; communication of all kinds wanting; and the whole undertaking, from the ignorance of those who embarked in it, fraught with much danger.

That tea planting in India has, of late years, made rapid strides forward, is beyond all question; and it has done so not only in the quantity of tea produced, but in the quality too. A good authority writing to the *Agricultural Gazette*, states the export of the past year will, probably, not fall short of 15,000,000 lbs. against 11,000,000 lbs. in 1870, and this estimate is exclusive of all the tea produced by the districts of Kangra, Kumaon, Dehra Dhoon, and the Neilgherries. Further on the same author states that the total export from India in 1862, amounted to only 2,000,000 lbs., so that within 10 years the production of tea has multiplied almost six-fold. The demand however has in no way slacked, for good fair teas find a ready sale in any quantity, both in London and Odessa, and many years must yet elapse before the supply is likely to be in excess of the demand.

The discovery of the indigenous plant in India, seems to be due (see letter in *A. G.*, Dec. 21st), to the traveller Bruce, and

[illegible] to Mr. Bruce. To the latter however is due the credit of having first subjected it to cultivation. The China plant seems to have been introduced very soon after; and at the present time hybrids of every type are to be seen in all the gardens of India. Experience however has shown that wherever a suitable soil and climate can be found, the indigenous variety is that which best gives the cultivator, and that when that fails, the better class of hybrids can, from the hardiness inherited from the China plant, be grown with the greatest chance of success. The cultivation of the China plant, except at extreme elevations, has almost become a thing of the past. Up to the present time the indigenous plant has only been found in its wild state in Assam, Cachar, Munipoor, Nepal, and the hill tracts of Chittagong. With regard to Cachar, an author states that it is only found in Southern Cachar, and never on the northern side of the river Barak.

In the North-West Provinces, tea was started under somewhat better auspices; but the results up to the present time, owing to the severity of the climate, the class of tea planted, and great mismanagement at the outset, have been less satisfactory than in Eastern Bengal. Government gardens were established under the superintendence of Dr. Jameson and shortly after their establishment, Mr. Robert Fortune appeared on the scene with fresh supplies of seed from both the black and green tea districts of China, and a gang of trained Chinese coolies. The district first selected as a field for experiment was the Kangra Valley, and tea planting is still carried on there with considerable success. All the good land however may be said to have been taken up long ago, and an outsider at the present time, would stand a poor chance. Excepting on the score of cheap labour, the Neilgherries hold out a far greater inducement to the intending planter; the soil being richer, the climate less severe, (and consequently more suited to the cultivation of the better kinds of tea), and the rainfall, if not greater in quantity, more evenly distributed throughout the year. From Kangra the Government experiments were extended to the neighbouring district of Kumaon, and a few years after their establishment, liberal supplies of seed raised from the imported plants, were distributed to planters gratuitously. In fact, Government sought strenuously to encourage tea planting and induce settlement in both of these districts; and though their efforts were in some cases misdirected, and the advice given by their Superintendent hardly of a kind that would go down in the present day, much good was done, and tea planting established on a pretty firm footing in these districts. Had the Government of Madras imported from Assam moderate quantities of indigenous and good hybrid tea seed, the enterprise would have been ere this on a much better footing. The pioneers here were none of them tea planters, and having no connection with the Bengal side, did not know how to get good seed, and those who did try, through sending to the wrong quarter, received mere rubbish. Having been bitten once, and in many cases lost some thousands of rupees needlessly, they preferred naturally to get on as well as they could with the article they found at their doors, the result of which has been that there is hardly a garden on the Neilgherries in which a good class of plant is exclusively cultivated. Considering the rapid rate at which tea cultivation is extending, it is not yet too late for Government to take steps in the matter.

The Government gardens in Kangra and Kumaon, can hardly be said to have been a success from a financial point of view; and some six or seven years ago they were sold to private individuals for trifling sums.

It is asserted that there are some gardens in Kumaon, which under high cultivation and scientific pruning, yield their 300 lbs. and upwards per acre per annum. This assertion, though must, until properly authenticated, be taken *cum grano salis*, as the plants are mostly of the China variety, and from the elevation at which they are grown, subject to protracted winters, and in many cases, severe frost and snow. Labour in Kumaon is cheap and plentiful, but this district too holds out but small inducement to a settler, having in addition to the above disadvantages, a more serious one, viz., the distance which the tea has to travel (part of the way on men's backs) before it can reach a market. Trade may hereafter be opened up with Central Asia, but in this case, some different system of manufacture must be discovered, by which tea calculated to suit the Tartar palate can be turned out.

In all the hill districts large gardens (300 acres and upwards) are the exceptions, and not the rule. They are mostly owned by men of moderate capital, who either work their own property, or leave it in the hands of a manager on a moderate salary, allowing him to purchase, or giving him some share in the profits of the estate. This principle is undoubtedly a good one, and with many men the inducement which it holds out to them to work goes a long way. When this system is not acted upon, the manager knows that his salary will come to him whether he works or not, and his time therefore is devoted to the superintendence of the estate from an easy chair in the verandah, and writing reports on things which he has not seen, and for which he is indebted solely to a fertile imagination. Of all classes of managers, this is the

worst, for so long as he does nothing, the writers, maistries, and coolies will strive hard to emulate his example, and the ruin of the estate becomes a mere matter of time.

On the whole, Eastern Bengal is the best district for a man of large capital, or for the man of strong constitution, who is willing to work hard on a good salary, and entertain a hope in time of being given or of purchasing a share in the concern which he superintends. To a man of limited capital, who wishes to work his own property, and live in a healthy climate, the hills are best suited.

In point of general advantages the Neilgherries seem to be a happy medium, possessing a climate equal, if not superior, to that of the Himalayas. They are capable of producing at suitable elevations, a yield little short of the average of the best districts of Eastern Bengal; labour is to be had in fair quantity, and at moderate rates, while from the nature of the climate, and the comparatively slow growth of weeds, &c., a smaller staff, in proportion to the area of the estate, will suffice. The rainfall seldom falls to any injurious extent, and when this does happen, the loss extends merely over a month or so, and not over the whole season, as in the case of coffee or any other plant cultivated for the sake of its fruit. All parts of the hills are accessible by a network of good roads, and means of carriage are cheap and abundant. But before going further on with this subject, it will be better to take a short retrospect of the past, to show how the earlier experiments in tea cultivation fell short of the ideas entertained of them, and how these errors of the earlier stages of tea cultivation not only may, but in many cases have been rectified. We think it an undoubted fact, that for the last two or three years, each succeeding year has seen on these hills some hundred additional acres brought under tea cultivation, and that if those interested do not relax their efforts, and the Government render what assistance they can, the Neilgherries will, ere a couple more are out, hold no dishonorable position among the tea-producing districts of India. We may safely say, that whereas in the year of the Neilgherry Agricultural Exhibition (1869), not 500 lbs. of Neilgherry tea found its way into the Home Market, the export of the present year will not fall far short of some 75,000 lbs.; and this out-turn may be expected to almost double itself every year for some time to come.

We learn from Colonel Nassau Lees' work on tea cultivation in India, that the first consignment of China seed sent to this country was that despatched by Mr. Gordon, in 1836. He remarks that:—

"In both his missions, Mr. Gordon sent round to Calcutta several "casks of seeds, some plants, and eight or ten Chinamen. From "this seed about 42,000 plants were reared, which were distributed "as follows:—

"Madras Presidency	2,000
"Assam	20,000
"North-Western Provinces	20,000

"* * * * * * * The plants sent to Madras "for distribution were planted at Coorg, Mysore, the Neilgherry "Hills, and in the Horticultural Society's gardens in Madras. "Six months after they arrived, (22nd August 1836), the Chief "Secretary reported to the Supreme Government, that the experi-"ment had completely failed, and with the exception of a few "plants on the Neilgherry Hills and in the Nugger country, the "rest had withered away."

Col. Lees states further on:—"It must not be concluded from "this that no part of the South of India will grow tea, as from "the unavoidable ignorance of those entrusted with these early "experiments, no other results could have been anticipated."

It appears however from statements made further on in the work above quoted, that the seedlings sent at this time to Assam and the North-West Provinces fared with little better success, and that the first successful attempt at the introduction of China seed to India was made by Mr. Robert Fortune, some years later.

As far as these hills are concerned, tea planting, as a speculation, was first attempted by Captain Mann and Major Rae, in 1839. The seed from which their plants were raised was of the China variety, and in Captain Mann's case, obtained, we believe, direct from China. In consideration of their being the pioneers of tea cultivation in this Presidency, Government gave them a free grant of land, and later on in 1842, when their estates came into bearing, sent down four Chinamen from the North-West Provinces, to instruct their coolies in the manipulation and drying of the leaf. The knowledge brought to bear upon the subject by these individuals appears to have been of little use, as their mode of preparation was not only found to be more costly, but also, we believe, to turn out tea of an inferior class to that which the proprietors had, without the assistance of the Chinamen, previously manufactured.

The real facts of the case are, that the sole information relative to the manufacture of tea in the earlier days of its cultivation on the Neilgherries, was gathered from descriptive accounts written by Chinese travellers, or from the pamphlet written by Dr. Jameson on the Kangra and Kumaon gardens, which were under his superintendence. Every work which contained any information on the subject of tea cultivation in Chinese lands, was at a premium; and as the opinions expressed by the majority of these authors was at variance, one with the other, there must have been some little difficulty in following out all the instructions given.

Dr. Jameson's treatise was based on his own experiments, carried out with the aid of a few imported Chinese labourers, and might be termed in our opinion, but a second-hand and stale edition of the systems advocated by previous authors. The advice given in this report would badly meet with the approval of the experienced planter of the present day. Mr. Fortune seems to have had a slight skirmish with Dr. Jameson on the systems of cultivation and manufacture in vogue in the Government gardens, and Col. Lees in his work, sides somewhat partially with the latter gentleman. He remarks, "Though not a "practical tea-planter, Mr. Fortune was a respectable botanist, a "fair agriculturist, and I believe an excellent horticulturist. He "had visited the finest tea districts of China, and was fully com-"petent to express an opinion on the suitability of the soil and "localities selected in the Himalayas, and the health and vigour "of the plants, as compared with those which he saw in China. "* * * * That Mr. Fortune had no practical experience of "tea cultivation and tea manufacture, was well-known."

The former portion of these remarks seems to damn with very faint praise one of the ablest horticulturists of the present day; the latter to lead us to believe that he travelled in China with his eyes shut. For our own part, we have not the slightest doubt but that he was better acquainted with the subject in question than Dr. Jameson, and that had his recommendations been carried out, the Government gardens would have benefited thereby. We doubt much if there is a single planter in the North-West Provinces, who will not declare that the system of cultivation practised in the Government gardens was not a tissure of blunders, and that it was left to private enterprise to undo the errors which the Government Superintendent had led planters into, and that they had to pay somewhat heavily for the privilege of doing so.

As for the Chinese manipulators, who, in these days were considered *a sine qua non*, we are all aware that the Chinese are not a progressive race, that, as Mr. Fortune remarks of them, "The Chinese farmer is not a chemist: he knows little or nothing "of vegetable physiology; but his forefathers have hit accidental-"ly upon certain systems, which are found in practice to succeed, "and to these he himself adheres, and hands them down to his "children." And these remarks are equally applicable to the native of India. He considers that what was good enough for his fathers, is good enough for him; that as they lived so may he; and that any effort on his part to raise himself in the social scale is not merely a mistake, but almost an insult to their memory. And, closely allied to this impression, is the idea that those who try to raise him, have no humane object in so doing, but merely serve their own interests.

In China,—a country teeming with population, and where labour and the necessaries of life can be obtained for an almost nominal cost,—little inducement is held out to the peasant to improve himself. The system of tea cultivation differs entirely. Instead of gardens extending as in India over from 200 to 500 acres of cultivated land, there are small holdings of a few acres, each worked by the proprietor's own hands,—a system of land tenure analogous to that prevalent in many parts of Ireland at the present day. In India, a single estate may send Home half-yearly a break of about 600 full chests (of 82 lbs.); in China as many hundred "estates" as chests would be necessary to meet the demand. There, the tea passes through the hands of some half-dozen middlemen, each of whom has to make a profit on the article, and adulterates it if he has the opportunity. Here, it goes direct into the market.

In this country, the labour difficulty is undoubtedly a drawback; but a remedy has in a great measure been found, viz. in the adaptation of machinery for the preparation of the leaf, in the improvement of the implements employed in the cultivation, and last but not least, the impossibility of adulteration before the tea reaches its market. These advantages throw a great weight into the scale, and added to these, the superior strength and more delicate flavour (the latter especially in the the case of hill teas), account for the high prices which they fetch in the London market, and the increased demand which arises year by year for Indian teas of fine descriptions. We believe the time is not far distant when Indian tea will be drunk throughout Great Britain to the exclusion of the China article: and we cannot fail to recognise how great an advantage would be gained thereby, not only by the consumers, but also by the addition that would be made to the revenue of the country.

The errors and mistakes made by the pioneers of tea cultivation have been remedied at a great sacrifice to those concerned in the enterprise; and planters in Southern India have, as a rule, availed themselves late in the day of the experience gained in other districts. Better late than never though, and we believe a successful future lies before them.

The first real onward movement, in the matter of tea cultivation, commenced about the years 1865 and 1866, when several estates were opened out at Kotagiri, and one or two smaller ones at Coonoor. Seed was imported from Bengal, and though in many cases as we have before stated, heavy losses were sustained by those concerned through the importation of damaged seed, the owners of these estates, nothing daunted, kept on; and it is probably owing to their energy, pluck, and perseverance, that tea planting on the Neilgherries bids fair to be an undoubted success.

These pioneers had not as in other districts, large supplies of seed distributed gratuitously by Government to fall back on. They had not grants of land, procurable at the upset price of two rupees and a half per acre, the period for payment prescribed,—extending over 10 years from the date of purchase, and their land free of assessment for ever; but they had at the very outset, to import seed from Bengal at a great risk, to pay as much for their land here in the first instance, as they would have had to pay in Bengal; and during the first three or four years of their occupancy, when they were spending money without getting any return, to pay an annual assessment of two rupees per acre for forest land, and one rupee per acre for grass land, in perpetuity. In purchasing the site for an estate, the purchaser has not only to consider how much land he requires for actual cultivation, but has also to ensure a sufficient supply of wood suited for building purposes, making boxes and fuel in addition to a certain area of land required for grazing purposes. On every acre of this land a heavy assessment had to be paid annually, and it is only within the last year that the Government have seen fit to remove this heavy burden, and to allow the planters to hold their land free of assessment for the first five years of their tenure.—*South of India Observer.*

COFFEE.

COFFEE CROP.

We are sorry to learn that, as anticipated, the coffee crop in Munzerabad and Coorg, for the season just closing, is considerably below the average, and to add to the troubles of planters, the leaf rot is making its appearance in Munzerabad, though we trust to no great extent. It is feared that if the disease should spread at this season of the year, it may materially affect the blossom on the setting in of the wet season, and the natural consequence will be little or no crop next year. Truly the coffee planter has hard times of it.—*Bangalore Herald.*

LEAF DISEASE.

A planting friend sent us the other day some leaves from the "Dimboola forest" clearly affected with disease, which we submitted to the Director of the Peradenia Gardens for his opinion. Mr. Thwaites favours us with the following:—"The white spotted leaves exhibit the attacks of a leaf-mining insect—a very minute fly which feeds between the upper and under cuticles of the leaf. The spots upon the mangoe leaves are caused by a common epiphyllous lichen; and are not at all alarming. The third kind of leaf has also been attacked by one of the insect leaf-miners of excessive minuteness, which in its progress, while feeding under the cuticle of the leaf has caused the beautiful spiral arrangement seen in the individual spots. I have not yet detected the coffee leaf fungus upon any leaves but those of the coffee, although specimens of leaves from a number of various plants have been sent to me lately."—*Ceylon Observer.*

COFFEE LEAF DISEASE IN WYNAAD.

We are aware that many estates in Wynaad have suffered from the leaf disease; in fact, we believe, that very few are entirely free from it. It is a disease to which all plants are liable; and we have the authority of a learned gentleman, who has paid much attention, not only to botany generally, but to the coffee tree in particular, and has, before now, been chosen by Government to report on cultivation in India, for stating that it is unlikely to do any damage to the trees. Practical planters also, who sometimes (too seldom we are sorry to say) favour us with their views, assert that though some temporary loss of wood, and perhaps even a diminution of next year's crop may ensue, the tree themselves will not suffer a bit more from this disease than they would from a rather heavy pruning. A few young estates, where it has been worst, may have the shape of the "rusty" trees spoilt; but on the other hand, many places that have had it mildly, will not suffer at all. Practical men are quite content to wait till the effects of the leaf disease, or any other ailment to which coffee, like all other plants is liable, have passed away secure, that in the long run steady cultivation conducted liberally, though not wasterfully, will bring in a good return. They do not expect bumper crops every year, nor do they consider their properties, as ruined, if for one year the produce hardly covers the expenditure. —*South of India Observer.*

COFFEE IN EXCESS.

When any article is in particularly good demand, and when people are not certain what its price may eventually be, or how much of it may be forthcoming, there is generally a rush to all kinds of substitutes or inferior qualities or shams, with which to supplement the short supply. Coffee is in no way an exception to this rule, and thus it has happened that since the 1st October last, not less than ten thousand cwts. of triage, brown and black coffee, have been shipped to Europe as native coffee, or about one-sixth of the entire exports of that quality. All this has sold readily, and at prices highly remunerative to the shippers. Against this proceeding there is not a word to be said; on the contrary we have always urged Colombo merchants to export these descriptions whenever their proceeds will cover cost and charges, as by so doing, they remove from the native dealer the means of "blending" his parcels of native coffee. Deprived of so large an amount of mixings as the above, the Moorish and other dealers are now resorting to another material, or rather they are extending their use of an adulterant previously much less extensively employed, we allude to those peculiarly coloured stones met with in nearly all parcels of parchment and native coffee, pieces of quartzy gravel, about the size of peas. These having been sifted from the coffee in merchants' stores have been thrown aside in heaps, until in some large premises, tons of them may be seen piled up. For some time past a regular trade has sprung up in these coffee stones, storekeepers thinking themselves fortunate in obtaining 6d. per cwt. for them. In one case a Moorman applied to the proprietor of a certain curing establishment—say for instance the Wattiepoll Mills, offering 6d. a cwt. for all the coffee refuse, but in vain; finding the sturdy proprietor resolute, the small-capped trader advanced his terms, but was exceedingly mortified to find that not only was his tempting offer of 9d. a cwt. rejected, but he was further told that his object was perfectly well-understood, and that he would not be allowed to carry on his nefarious trade through that establishment, on which the Mahomedan dealer departed, evidently much hurt in his feelings, if one can fancy a Mussalman's feelings capable of feeling hurt. We state these few plain facts, in the hope of putting others on their guard as to these stone bargains.—*Ceylon Times.*

REFUSE COFFEE.

An Onvah planter writes:—"Should it be any information to you, and worth a paragraph in your paper, you may mention that I have to-day sold at my store, a quantity of rice coffee, the produce of tails, refuse parchment, pounded and cleaned, at 22 1 per bushel—2½ bushels making 1 cwt.! If my brother planters would occasionally record the price of coffee, rice, rates of cart hire prevailing in their immediate neighbourhood, &c., it would be of great service to many." We have already alluded to the greatly increasing business in refuse-coffee:—the purchase of trash in Colombo to be sent by rail to Kandy to be mixed up with lots of garden parchment and sold once again to the merchant as good coffee. The practice has so largely extended that a high Railway Official has been heard to say the traffic in so-called coffee up would soon equal that of coffee down! The temptation to utilise refuse-coffee during the present season of short crops and high prices is especially strong, and we fear there is little prospect of exporters uniting to get rid of their refuse in a way that would prevent it being brought again into circulation. Some time ago, we believe the experiment was made of shipping a quantity to Mauritius where, of course, it would only be taken for what it was worth in a consuming market, but we do not know if the result was satisfactory. It is quite clear however that if the present process is to go on, the Planters' Association and Chamber of Commerce will have to look nearer home for a system of adulteration which may require repression equally with that carried on in the United Kingdom. If coffee-dealers in Ceylon cheat each other with impunity, and everybody concerned winks at certain practices, how can we criticise the British grocer when he exposes for sale 90 per cent. of chicory and 10 of coffee, as "a mixture of coffee and chicory?"—*Ceylon Observer.*

ENEMIES OF THE COFFEE-TREE.

(From the Ceylon Observer.)

We have been favoured with a copy of the *Gardener's Chronicle* in which the following contribution of interest to Ceylon Planters, appears:—

"We have recently received from our excellent friend, Mr Thwaites, a specimen of a minute fungus which has caused some consternation amongst the coffee-planters in Ceylon, in consequence of the rapid progress it seems to be making among the coffee-plants. A few trees were noticed to be infected in May last, and at the same time of Mr. Thwaites' communication (July 24) two or three acres were showing the fungus upon the leaves. These latter fall off before their proper time, and fears are entertained as to the effect on the amount of the crop.

"The most curious circumstance is, that amongst more than a

thousand species of fungi, received from Ceylon, this does not occur; and that it is not only quite new, but with difficulty referable to any recognised section of fungi. Indeed it seems just intermediate between true mould and Uredos, allied on the one hand to Trichobasis and on the other to Rhinotrichum. Though the fungus is developed from the parenchym of the leaf there is not any covering to the little heaps such as is so obvious in Uredo and its immediate allies, while the mode of attachment reminds one of Rhinotrichum. We are obliged therefore to propose a new genus for its reception.

"As the fungus is confined to the under-surface of the leaves, and the mycelium is not superficial, it may be difficult to apply a remedy; but we should be inclined to try sulphur by means of one of the instruments which are used in the Hop grounds in Kent, or syringing with one of the sulphurous solutions which have been recommended for the extirpation of the Hop mildew. *M. J. B.*" [Rev. M. J. Berkeley.—Ed. C. O.]

THE FERTILITY OF SOILS.

(*Queenslander.*)

In a recent letter to the New York Farmer's Club, Professor S. W. Johnson, of Yale College, says:—"The labours of chemists to discover positively all the causes of the fertility of soils, have not yet met with conclusive success. The mechanical structure of soil is of primary importance. Naked rock grows lichen; the same rock crushed into coarse grains grows a much higher order of vegetable; pulverised fine, the cereals grow in it. Geology, chemistry, botany, physiology, meteorology, mechanics, hydrodynamics, heat, light, and electricity are all intimately combined in the grand process of vegetation. There are sandy soils in our Eastern States which, without manure, yield meagre crops of rye and buckwheat: but there are sandy soils in Ohio which, without manure, yield on an average eighty bushels of Indian corn an acre, and have yielded it for twenty to fifty years in unbroken succession, the ingredients of these soils being, by chemical analysis, the same. At present no difference is known between them, except the coarseness of the particles—the first being coarse, while the Ohio sand is an exceedingly fine powder. The power of soils to attract and imbibe moisture and oxygen, was well shown by Schubler of Hoffen, forty years ago. Of thirteen different soils, quartz sand absorbed in thirty days 1·1000 parts of oxygen and no moisture, while humus absorbed thirteen of oxygen and 120 of moisture."

Surface water that flows off the land instead of passing through the soil, carries with it whatever fertilizing matter it may contain, and abstracts some from the earth. If it pass down through the soil into drains this waste is arrested.

The principles above enunciated exemplify the difficulties of coffee-planting. We cannot plough and harrow the soil so as to pulverize it and expose it to the action of the atmosphere, nor can we build sunk drains to receive water filtered of its fertilizing materials by the earth. But by means of manure and water holes, and forks to puncture the earth, we can do a good deal to bring inert soil into action.—Ed. C. O.]

COFFEE CULTIVATION IN INDIA.

The cultivation of coffee in some parts of India has ever been beset with difficulties, and it may be said that it is a wonder it has been nevertheless carried on to a great extent in those parts. The planters, besides the disadvantages incidental to extensive cultivation of coffee, have had for some time to wage war with the borer, that pest which threatened to ruin permanently many estates in Coorg and other districts. They have now the coffee-leaf disease to contend with, and this promises to become a formidable enemy against the cultivation of coffee in India. The cause of this disease appears to be as yet undiscovered, although various theories have been put forth by planters regarding it. Some ascribe the appearance of the fungus on the coffee leaves to hot weather, but it has been found that in places where much rain had fallen, the coffee plants have not been free from it. A Mofussil contemporary makes the following observations, which would afford to our readers some idea of the nature of the disease. "One planter has suggested that it is caused by the extensive use of artificial manure and especially by *bone dust*: the fields manured with this having caught it first and suffered most, part of the estate did not suffer at all. In flat opposition to this theory another writer says that estates which have never had any manure applied to them have suffered severely. Manuring *per se* could never originate the disease, though it might be introduced through the medium of manure. The disease is said to be a well-marked fungus and not a mere degeneration of the tissues of the coffee-tree. It is an independent growth, deriving its sustenance from the juices of the coffee-tree. It is widely propagated by means of its spores which are light enough to be carried long distances by the wind. From this it is difficult to suggest any remedy for stopping the pest. As the spores are fed upon by the larvæ of a species of fly, it is thought that it may tend to destroy the spores as fast as they are produced. Nothing is known of the way in which the coffee was first infected, but it is supposed that it affected some of the indigenous plants, and thence found its way into the cultivated coffee." Some of those who have examined the coffee-leaves affected with the disease declared it as their opinion that it is a true fungoid growth. The report of Mr. Cochrane on the subject will be read with interest:—"Associated with Dr. Muter of the South London School of Chemistry and Pharmacy, I examined the leaves by his fine microscope, first with a low (½ inch) power. The blight resembled a crystaline deposit on parts of the surface. A higher power displayed a dense mass of fungoid growths, having a yellowish, greenish hue. I afterwards scraped off a portion of the blight on a glass slide, moistened it with a drop of distilled water, covered it with a thin glass dish and subjected the object to the ⅛ inch power, the highest in practical use. The appearance presented was that of kidney-shaped cells having serrated edge of a greenish, yellowish hue. At the first examination, Dr. Muter suggested that this blight might be pollen wafted from some parasitic plant, and adhering to the coffee-leaves had undergone fermentation on them. After discussing the subject thoroughly, we agreed that from whatever source derived, the blight was a true fungoid growth. It might be well to ascertain therefore whether or not there is any extensive waste land adjoining the coffee plantations producing weeds having a greenish yellowish flower; to watch what wind was likely to carry the pollen in the direction of the coffee-plants; then to interpose a barrier of bamboo, cocoanut, or other coppice so as to interrupt the flight of the minute organisms, if the waste land cannot be reclaimed." The freedom from the blight of the coffee-plants in Travancore and Native Cochin is a matter of congratulation to those who have invested their capital in coffee planting, and to those who intend to open out other estates, in these States. The opinion entertained by Dr. Muter, and, as far as we can see, by Mr. Cochrane as well, that the disease might be caused by pollen wafted from some parasitic plants, would appear to receive confirmation by the state of things in Travancore and Cochin. In these provinces, the coffee estates have no contiguous waste lands, and they are surrounded by larger vegetation such as to interpose the "flight of minute organisms" if there be any, from parasitic plants. And hitherto, as we have said, the cultivation of coffee in Travancore and Cochin has been unattended with the coffee-leaf-disease difficulty. Whatever may be the cause of the blight, we fully expect that it will not appear in Travancore and Cochin, unless perhaps, when coffee cultivation becomes very extensive and the surrounding larger vegetation are cut down. In the district of Wynaad, we may add, the disease does not seem to have attacked many plants; in fact, from intelligence we have received, we infer that it has not made its appearance there.

COFFEE ESTATES IN SOUTHERN INDIA.

Many of our readers being interested in coffee-planting, it may perhaps be acceptable to them if we pass under brief review, from time to time, the present circumstances and prospects of the chief growing districts in the South of India: we may begin with the Coorg districts.

The coffee estates in Coorg may be classified in three groups; the Mercara plateau, the Ghat, and the Bamboo estates. Each group has its peculiar characteristics, advantages, and disadvantages. The Mercara plateau on an average elevation of 3,500, and in its planted higher portions rising to upwards of 4,000 feet, enjoys a bracing climate, being equally exposed to the sweeping monsoon rains and to the dry east winds. With an average rain-fall of 121 inches, extended over almost the whole year, the moisture is ample. The granitic soil consists generally of a red felsparic clay, more or less mixed with gritty ferruginous stones, and covered with a layer of humus. The lay of the land being steep, it is evident that unless cultivation is carried on with due precaution against the "wash" of the surface soil, by terracing, draining, or a judicious system of weeding, the trees will in a few years be deprived of the coolest and most nourishing portion of the soil, and the land become sterile. Artificial shade is not required. Sheltered hill sides and gently sloping valleys are here covered with the most luxuriant and productive trees. The last crop proved a most satisfactory one, except where an estate had borne heavily in the previous year. Such a periodical ebbing is however in the nature of things. From the general appearance of the trees after crop, the prospects for the coming season are again, we understand, very fair. Some of the finest estates in this group are the Abbial, Haleri, Beltimullay, Glenmore, and those belonging to the Coorg Coffee Company.

The Ghat estates extend over both sides of the Sumpaji valley on the road to Mangalore, and on the Pussulady Ghat beyond Verajapet, on the eastern and western declivities of the range of the Western Ghats. This group of estates being originally covered with primeval forest, possessed a spendid soil for cultivation, its fertility being heightened by a heavier fall of rain, and by an invariable condition of atmospheric humidity. The extensive felling of forest however, combined with a probably faulty system

[illegible] with each other in scantily wooded [illegible] the best portions of the soil of the [illegible] seem to have been washed away, leaving the [illegible] without nourishment, and during successive seasons of drought these fell an easy prey to the borer. Besides this well-known enemy to coffee, the fog, the leaf-rot, and now the leaf disease, have severely affected some of these estates: but still there are many plantations in this group, which favoured by natural conditions and judicious management unmistakably prove, by their present yield, the high capabilities of this range of land. The leaf disease has made sad havoc, we hear, especially on the Pumpkinhally Ghat, where several estates present a most desolate aspect, the trees being not only devoid of leaves, but many of them actually dead and dry.

The Bamboo district which comprises the third group of estates lies between the river Cavery and the Mercara trunk road to Vezalapet, and thence to Attur Tittymutti. Its elevation varies from 2,000 to 3,300 ft. Its annual rain-fall amounts to about 65 inches. The nature of the land generally presents undulating slopes, and but few steep hills; the soil is of the richest kind, as the humus from an exuberant vegetation which annually decays or is consumed by jungle fires, has accumulated for ages without being disturbed by heavy floods. The rain-fall is gentle and seasonable, and the growth of coffee throughout the district most luxuriant and productive. In fact, if anywhere in Coorg, the Bamboo district is the very habitat of the coffee-tree, and had it not been for borer-pest, which committed its most destructive ravages here, the Bamboo estates would have secured the first rank in Coorg from the very beginning. The borer is however no longer the dreaded enemy to the insidious ravages of which the planter has helplessly to resign himself. Its destructive progress has not only greatly subsided, but experience has taught the planters by vigorous and timely measures to keep it down to a minimum. On these estates artificial shade is deemed necessary; the local varieties of the fig-tree, with jack, toon, and uttari, seem to answer best. Foremost of all the plantations in the Bamboo, and perhaps in the whole of Coorg, is the Palkay-Betta estate under the able management of the joint proprietor, Mr. H. Minchin. The next place is due to the Nellagotta and Catherine estates. The productiveness of these estates, and especially that of the first-named is extraordinary: a crop of 250 tons is expected we hear from an area of about 400 acres in bearing. One small portion of the estate, of about fifteen acres, looks like the ideal of perfection in a coffee-plantation. The lay of the land is a gentle slope, the soil a deep brown mould, the trees faultless in regular growth, and nearly six feet in height, though only two years old, the rows of trees in exact geometrical lines, at equal distances, so as to preserve, wherever one looks, the utmost precision. But the most satisfactory result is, as stated by Mr. Minchin, that this small portion of two years' old coffee, repays with the first crop the total outlay on it from the commencement, a fact perhaps never yet realized in coffee cultivation! Some of the oldest of the trees have given, we are told, fully a ton of coffee per acre. Fears are justly entertained that such an excessive productiveness cannot last, that the trees must kill themselves by overbearing. Left to themselves, this prognostication might be true enough, but when the trees are properly treated by a system of high cultivation, a steady annual crop of a high figure may, we should think with favourable seasons, be confidently expected.

The season of the past year, though by an excessive rain-fall injurious to the Ghat estates proved, by the early showers in January, March, April, and May, and by the long-continued gentle monsoon weather, and the latter rains in October and November most welcome to the planters in the Bamboo district and on the Mercara plateau, where the amount of new-bearing wood in the trees holds out the prospect of a promising crop for the ensuing year. The total rain-fall in Mercara from 1st January to 31st December 1871, amounted to 130·08 inches, or 22 inches over that of 1870, and 9 inches over the average rain-fall in that station, and it is hoped that with the past year Coorg, at all events, has entered upon a series of seasons, more favourable to the cultivation of crop than heretofore.—*Indian Statesman.*

COFFEE PROSPECTS IN COORG.

Referring to the above article which appeared some time before in the *Indian Statesman*, a correspondent of the *Madras Mail* writes:—

"I think it would have been more to the point, if the brief review of the prospects of coffee-planting and coffee-planters' crop in Coorg, with which your contemporary indulges the public, had been put off till after crop. Estimates are not always realized, and they are, if published, and not afterwards as publicly compared with the crop really harvested, calculated to do harm. I have been a coffee-planter in Coorg for some ten or eleven years, and I believe I am justified in saying that the prospects of coffee-planters in Coorg, on the whole, are worse now than they have ever been before."

THE PRODUCTION OF BRITISH INDIA COFFEE.

One of the greatest articles of consumption by the British public is coffee. During the past year the quantities imported amounted to no less than 180,000,000 lbs., valued at 4,065,000*l.* sterling. The chief coffee-planting country in the world*—namely, Ceylon—sent us 68,000,000 lbs.; the Brazils and Central America, where the berry is of comparatively recent growth, 30,000,000 lbs.; our Indian Empire contributed 19,523,000 lbs.; nearly the whole of this quantity being produced in the Mysore districts of the Madras Presidency. Compared with any former period—twenty years ago—the contrast in the whole of the imports of Great Britain seems marvellous. As an article of re-export, coffee stands out prominently in the transit account—no less than 144,821,000 lbs.—the Germans, the French, and the Dutch being even larger coffee-drinkers than ourselves. The croakers about unwholesome condiments seem to possess some grounds to rest their complaints upon, for with all its recommendatory qualities—and they are not a few—the consumption has fallen from 1¼ lbs. per head in 1860, to less than 1 lb per head of the population in 1870. For such a decline there must exist some cause deserving the attention of coffee-roasters and retailers; and this is still more apparent when we compare the results of the consumption in the other articles of cocoa, tea, and sugar, which have vastly increased. Whilst our West Indian possessions have actually declined in their production, British India has advanced rapidly. The exports of Indian coffee shew this: they were, in 1850-51, 7,257,421 lbs.; and in 1860-61, 19,119,209 lbs.; and in 1870 our share alone was 19,523,000 lbs.

The success of the coffee-planting has given an example to other parts of India, and the plant, originally taken from the Baboodan Muth, is now extending over Coorg, the Wynaad district, the Neilgherry Hills, and along the Western Ghauts, north and south. The plantations in Mysore number 21,538, and cover 107,971 acres; 263 belong to Europeans, the remainder to natives, the average size of the former being 121 acres, of the latter 3¼ acres per garden.

The average produce per acre of the best coffee districts is however probably not half that of Ceylon, these districts are confined to the region of the Western Ghauts and the Baboodan Hills. Some attempts have been made to cultivate coffee in the open country, but without success, it seems to require forest land and considerable elevation and moisture. The Ceylon planters who have undertaken the cultivation for the Indian proprietors, into whose employ they have entered, are said to have been greatly misled by their former experience. They were induced to follow the system of Ceylon where, in many districts, rain-falls more or less during eight months out of the twelve, and where there is scarcely a month without some moisture, but in India the climate is exactly the reverse. Taught by what was an ample and sufficient experience in a moist climate, those who had shade to preserve their coffee in the long dry months cut it down as fast as possible, and numerous plantations were found when not a tree was left standing. The consequence was enormous loss, which took many years to recover. The proper plan appears to be, to allow a secondary growth of forest trees to spring up, and to supplement such by planting trees most suitable for coffee shade. The advantages derived from growing coffee in the shelter of the original forest are numerous. From the greatest part of the land being only cleared at first from underwood, and from the fact of that being burnt in heaps, a large proportion of the soil remains uninjured by fire, and the valuable surface of the mould is entirely preserved. The forest trees afford shelter to innumerable birds which are of incalculable service as insect-eaters. Then the planter, with his shade, if he does not altogether laugh at dry seasons, in a great measure neutralises their influence by preventing the sun and the wind from drying up the soil and parching the plant. He and his people can work away all day and seldom feel the fierce rays of the tropical sun, which consideration alone is of immense value to an estate.

In appearance a full-grown coffee-tree very closely resembles a Portugal laurel which has sprung up rather tall and slim. At the distance of many yards it would be difficult to tell one shrub from another; but the growth of the coffee-trees is more regular than that of the laurel. The branches spring in opposite pairs from the stem, and each pair shoot out at right-angles to the pair above and the pair below; thus supposing that the pair below shoot out north and south, the pair above will grow east and west, and so on alternately. The distance for planting should be regulated in accordance with the soil, aspect, and climate, in some instances a tree may be grown that requires 6 feet by 6 feet, and it may also happen that even 4½ feet by 3½ feet may be too far apart. If allowed to grow to its natural height the coffee-tree will commonly be found to measure from 12 feet to 15 feet, and trees of that size may often be seen near the houses of the farmers. But the European planter reduces his shrubs to, at the most, 4½ feet, and sometimes as little as 3 feet; and in windy and exposed situations 2½ feet have often been adopted as the best height. After a tree has been topped, it soon throws out shoots

* A curious slip for "the farmer," Brazil produces five times as much coffee as Ceylon does. What the writer meant was that Ceylon produced the larger quantity of coffee imported into Britain.—Ed. C. G.

all over the stem branches, and the early removal of the shoots on the stem and the thinning of those on the branches require immediate attention. If the tree be not carefully kept in order at the outset, the difficulty of getting it into form will be very great, as all neglected trees present an impenetrable mass of twisted branches which are a puzzle to the pruner; and where the tree has been long neglected, the lower branches die off altogether, leaving a sort of matted umbrella at the top of the tree. The crop will be ready to gather from October to January, when the ripe berries should be carefully picked from the trees by hand every morning, and dried in the shade—the sun being apt to make them too brittle. They must be carefully turned to prevent fermentation, and when sufficiently dry the husks must be removed and the clean coffee separated from the broken berries. After being picked out and put aside, and then again dried, it is fit to pack.

For an individual to start with in coffee-growing, "The experiences of a planter in the jungles of Mysore" have led to the conclusion that a capital of 5,000*l.* is necessary. In purchasing an estate, too, there is one sure guide to the value of a district which may be firmly relied on. If the estate frequently changes hands, it is certainly a bad or indifferent one; if seldom, you may be pretty sure that coffee pays very well—and further than that a man need give himself no concern, for hardly any investment pays so well in India as good sound coffee property, and people are therefore seldom inclined to part with it. There is also another useful suggestion for those who do not make their fortunes in a few seasons (and such persons are probably the majority), and that is, to commence by putting down cinchona plants amongst the coffee, and in any corner that will hold a few trees, plant the swampy ravines with cardamoms, and margins of their lands with sandle-wood-trees. "Be aye sticking in a tree, it will grow while you are sleeping," should never be forgotten by those who wish to profit by the experience of others.—*Grocer.*

COFFEE IN ALL COUNTRIES.

("A CUP OF COFFEE," HARPER'S NEW MONTHLY MAGAZINE.)

As the beverage came more and more in demand, inquiries were also made after the plant which produced the bean—a word not derived from our English word bean, but from the Arabic *bon* or *bun*, which is the name of the fruit of the coffee-tree, and so happily coincided with the views entertained by French physicians on the subject that they reasoned that a fruit called *bon*—good—could not possibly be hurtful. Efforts were at once made to acclimate the shrub; but it would not thrive in the severe climate of Europe, and hence it became necessary to cultivate it in distant colonies. The indolent son of the East thought so little of deriving an advantage from this most valuable gift which nature has bestowed upon him that he not only failed to raise it, and to make it an article of export, but to-day allows the more active Western man to provide him, at a great profit, with the product of his own soil. As early as 1650 the industrious Dutch carried the seeds of coffee-trees from Mocha to their rich colony of Batavia, enlarged the enterprise rapidly, and were able in 1710 to appear in the great markets of the world with large supplies of Java coffee. Encouraged by this success, they established similar plantations in Sumatra, Ceylon, and other Sunda islands, which now furnish over two hundred millions of pounds; the French and the English followed their example, and in a short time the coffee-tree had made the voyage round the world. There is a little fragrance of romance connected with the first French effort of this kind, which was made in Martinique. Louis XIV., who, in spite of all his foibles and vices, was fully able to appreciate the importance of such apparently small matters as a potatoe tuber or a coffee-bean, had in his private gardens a coffee shrub of five feet height, which before his death (1715) bore ripe fruit. Having heard of German coffee plantations in Surinam, and of Dutch establishments in Berbice, his ambition was aroused, and he desired to have French plantations also in his West India colonies. He entrusted, therefore, a slip from his pet tree to a naval ensign, Des Clieux, with orders to carry it safely to Martinique. Unfortunately the ship on which he served had an unusually long voyage, fierce storms alternating with provoking calms, and at last the water casks were empty. The ensign however sacrificed his own wants for the sake of the young plant, and shared with it his scanty ration of water. But his troubles were not at an end when he at last reached the island; storms and tempests, men and beasts seemed to have united to threaten the tender shoot, and Des Clieux had to place a guard over the plant, who, under his own supervision, watched it by day and by night. Fortunately it grew and throve, till it became a fine large tree, the ancestor of all the French coffee plantations on the West India Islands. It may safely be said that never was tree more carefully tended, and never more usefully employed. Another worthy patron of the pretty shrub was the famous burgomaster of Amsterdam, Nicholas Wythsen, who raised young trees in his hot-houses in Holland, and then sent the fruit-bearing plants to Surinam and Africa, and through his friends to almost every portion of the globe. All the West India Islands, as well as South America, soon had their plantations, Arabia its "gardens," as they are called, and even Madagascar and Ile de France and Bourbon [illegible] joining the lists against the older colonies. The shrub and the fruit have remained nearly the same everywhere, but the manner of raising the tree differs according to soil and climate. At least, in Arabia Felix, where the most valued of all varieties, the golden Mocha, is raised, the trees present a strange contrast with the aspect of the landscape further northward. There a low sandy shore affords a free view over vast treeless plains which stretch in sad monotony as far as eye can reach, while the cloudless sky sends down an almost unbearable heat. Only here and there a fruited palm, with lean grass and a few graceful palm-trees, breaks the mournful uniformity; in the grateful shade a few Bedouins rest under their black tents, while their brethren hasten on the uncouth dromedary through the yellow desert. Very different is the scene on the southern slope of the great peninsula; for here an abundant fragrant vegetation unfolds its riches and enchants the senses; incense grows like the juniper of our woods, whole forests of palm-trees overshadow the lower part of the mountains, and vast stretches of durra wave like golden grain in the gentle breeze. This is the home of the coffee-tree. The shrub rises in the form of a pyramid to a height of forty feet; the leaves, resembling those of the laurel of Greece, shine with a dark lustre in the bright sunlight, while lighter hues give life to the beautiful scene whenever the breeze turns up the lower side. During spring, a profusion of white blossoms covers the tree with their pure colour. They are shaped like those of the jasmine, and break forth from between every leaf and the stem, filling the air far and near with their perfume. Butterflies flutter incessantly around them, for they are rich in honeyed stores; birds fly about; lively tiny streams murmur at the roots, washing every tree with their welcome waters, and allure at times the shy gazelle that comes running up in timid haste, and anxiously looking around, to slake its thirst. Locusts are chirping on every branch, and a cloudless blue sky looks down upon the exuberant splendour, till the blossoms fade and droop, the winds carry away the light, shrivelled leaves, and the small green button peeps out, which rapidly increases and grows into a scarlet-red berry. After a while these berries become dark violet, but at the same time—thanks to the effects of a tropical climate—the tree produces a second and third crop of snowy blossoms, so that the beautiful green pyramid is covered with buds and flowers and fruits at every stage of development. When the fruit is ripe, the Arabs spread soft mats under the tree, ascend it, and shake the branches till all the berries have been gathered. They are then spread out on mats for six or eight months, till the fleshy part is completely dried, when a powerful roller passes over them, crushing the hard shell and leaving the two twin beans which each fruit contains to be carefully collected and cleaned. The latter are then still further dried for some time, being hung up in loosely woven bags, after which they are baled and sent to Beit-el-Fakih, the principal market of Arabia, where over twelve millions of pounds are annually shipped. As the coffee-tree is the principal source of income for Happy Arabia, it is, of course, most carefully tended and nursed. The coffee gardens are laid out on terraces which rise to a height of 3,000 feet, and on each of which there is an artificial pond with thousands of small canals that irrigate the whole, falling gently from terrace to terrace, to keep the soil always moist. The trees are planted so closely that not a ray of the sun can pierce through the thick shelter of their foliage, and the young plants can grow, thus protected, to supply the places of their shortlived predecessors: for the shrub, which begins to bear fruit in the third year, gives annually from three to five pounds, but declines at the age of twenty-five. The coffee plantations in Cuba and the West Indies are very different. Here also irrigation is all important, but much easier than in arid Arabia; hence the enchanting gardens are here all on a level, divided into squares with three or four rows of shrubs, and intersected by canals which incessantly feed the thirsty plants. To protect the latter against the immoderate heat of the sun and the frequent tempests of of those regions, lofty trees surround the plantations on all sides and superb avenues of palm trees, pass through them at right angles. In the rear, overshadowed by gigantic banana trees stand the huts of the labourers, each of whom attends to a thousand shrubs. The latter are not here allowed to grow higher than about six feet, and the process of drying and preparing the bean for market is both much shorter and more thorough. While Jamaica coffee bring the highest price in England, the taste of other nations is so different that every variety finds a ready market, and what is perhaps, most remarkable, we are told upon high authority that the worst coffee produced in America will, in ten to fourteen years, become "as good, and acquire as high a flavour, as the best from Turkey." The fact is that soil and climate determine the quality of raw coffee far more than the mode of collecting and drying it, and that the flavour and quality of the beverage again depend almost entirely on the manner of roasting the bean and preparing the infusion. Nor is the manner of enjoying the cup of coffee less varied in different parts of the world. The son of the Orient, drinking his coffee unmixed, swallows

the black but nutritious sediment with the infusion, and consumes at times not less than eighty cups daily. Far out on the burning desert he sits under his black hair tent, silent and motionless, till in the other half of of his airy dwelling the Nubian slave has prepared his refreshment. When his pipe and his cup are handed him he leans luxuriously back on his cushions or his bales of goods, resting an indolent glance at the drooping horse, tied to a post before his tent, or the weary camel crouching on the sand and chewing the cud; but soon his eye becomes animated, his fancy revives, and he thinks of the fate of his beloved ones at home, or he weaves fantastic fairy tales into bright stories and graceful verses. The monotonous noise of the mortar in which, all day long, the small beans of dark yellow colour are crushed, so as to furnish an unbroken supply, alone accompanies his thoughts, and fills up the vacant moments by its uniform rhythm. Or he is in Stamboul, the Happy City; a marble paved court-yard, overshadowed by mulberry trees and pomegranates and freshened and cooled by a merry fountain in the centre, which cast its spray in fitful showers on roses and jasmine; an open staircase leads up to a well-lighted room, with bright-coloured hangings on the walls, and richly dyed rugs scattered over the inlaid floor; gold lists, arabesques, and mother-o'pearl in profusion adorn the ceiling; and in pretty niches, behind skilfully carved doors, stand delicate cups and boxes for tobacco. The windows look down upon the cool yard, and a long, low divan, with soft cushions, runs along the wall. There is no chair, no mirror here; no table and no picture as in European coffee-houses; but black servants in brilliant costumes walk slowly about offering chibouk and coffee-cup to every guest. Silently he enters, in silence he smokes his pipe and drinks his cup of coffee, and silently he leaves the house again. A few guests perhaps are busy at chess; others may listen to the story-teller on the little platform there with the Persian rug on which he sits, or they gaze with stolid eye at the juggler, who produces from under his thin strip of carpet whatever is asked for by his audience. But no one opens his lips; no one reads a journal; there is no interchange here of thoughts; no making of acquaintances or forming of friendships. The dreamy still life of the Orient knows no other enjoyment but listening in silence while smoking and sipping the cup of coffee. Far more lively is the coffee-house in the noisy cities of Persia. The muezzin has as sooner announced the hour of morning prayer from the balcony of his minaret then fearful sounds are heard floating down the narrow tortuous streets. They proceed from the keeper of the public baths, who blow their cow-horns to announce that the water for the women's bath is ready. The dogs raise a terrible howl to express their disgust at the hideous sound, donkeys bray in deep gutturals, cocks are crowing in every yard and every garden, and sleep is soon out of question. In an instant the whole city is alive, and tall men in loose trousers and ample cloaks are seen hurrying from all sides to their favourite coffee-houses. Through a rounded door they enter a court with a fountain, and ascend by a wide, easy staircase to the vaulted hall above, where there is a large number of windows adorned with diminutive pieces of coloured glass, and the dazzling whiteness of the walls is relieved by a multitude of leaves and flowers engraved with a chisel, and filled out with blue and gold. Here also a fountain plays merrily in the centre; one whole side is taken up with niches, and along the other sides crowd the smokers and drinkers, listening to the songs of Hafiz, the wise sayings of Saadi, or the heroic poems of Firdousi. How different the café of France or Italy, where all is splendour and magnificence, while busy, noisy crowds gather there from morn till night! how different from the more silent, almost lugubrious coffee-house of England, where already in the days of the Stuarts affairs of such importance were transacted that Macaulay could compare the regular visitors at those places to the "fourth estate of the realm!" It may well be regretted that coffee-houses are, except in New Orleans, unknown to this country where the bar, with its fiery drinks and its mixed assemblies, has furnished but a sorry substitute. We may well ask, in conclusion, what magic power, what irresistable charm there is in the cup of coffee to make it such a universal favourite, and if not a necessity, at least the daily and most cherished drink of a hundred millions of men? Its influence on the well-being of our race and the tendencies of modern culture is enormous, and its effect on social life almost beyond calculation, because, in detail, it escapes observation. It would seem as if all the nations of the earth had instinctively recognised in coffee a benefactor, whose kindness they must acknowledge, though they cannot assert in the precise mode of action. Its sensible effects are too well known to require explanation. It exhilirates, arouses, and keeps awake; it allays hunger to a certain extent, refreshes the weary, and imparts a feeling of comfort and repose. It makes the brain more active, while it soothes the body generally; and, physiologically speaking it makes the change and waste of matter slower, and thus lessens the demand for food. Strong black coffee is most active, and may be dangerous, and yet it is a greater favourite with thinkers and all brain-workers. Nervous persons, who are easily excited, people of full habits or of melancholy disposition ought to avoid the cup of coffee in spite of all its attractions. On the other hand, it has been found invaluable for soldiers upon the march, and even in camp, and especially far superior to brandy in protecting them against fatigue and exposure. Wherever it has become a favourite it has superseded spirituous beverages, and its refining effect is felt as much in the lower classes as its gently stimulating powers are appreciated by the writer and the thinker. If Queen Elizabeth, it has been well said, had taken a cup of coffee in the morning, instead of breakfasting upon half a pound of bacon and a quart of beer, she would have probably felt in a gentler mood all day long, and her unfortunate sister Mary might have been saved the horrors of the scaffold. Unfortunately the ordinary cup of coffee contains but little of the precious substance, the caffeine, to which all its pleasant and benign influences are attributed by men of science. The adulteration begins in Arabia already. Dalgrave, the best and most recent authority on that subject, tells us that of the best variety, the Mocha, but little ever leaves Arabia. Even before the bales reach the nearest ports, Alexandria, Jaffa, or Beyrout, they have already been picked again and again. Expert hands inspect it grain by grain, and instead of the hard, round, semi-transparent beans, which alone are fit to make the genuine cup of coffee, only opaque, defective, and whitish beans ever reach the outward-bound vessel. Hence the quality of coffee diminishes with increasing rapidity as the distance becomes greater from Djeneess, and the process of sorting and picking is repeated again and again. In Arabia the Mocha bean holds the first place, next comes the Abyssinian, then the Indian, and, as the worst of all, at the end of the list, the American bean, mainly because of the want of care in gathering the fruit. On the Continent of Europe, Java is preferred; in this country Rio is probably the favourite with the masses, on account of its stronger aroma.

ANNUAL COFFEE REPORT.

1871 has been remarkable for an extension of trade beyond any yet recorded; not so much as regards the increased importations as the greatly augmented exports, which have kept the stock at almost all times below that of 1870, and as advices of considerably diminished crops in the larger producing countries have been constantly received, the demand for all descriptions has been animated, causing a continual upward movement in value, and the severe depression of the previous year has not only been wholly recovered, but, in many instances, very importantly exceeded. The greater decrease in the production having however occurred in Brazil and Java, the demand has extended to all qualities below a medium point, and exhibited an activity far exceeding that for colory kinds, and the rise in value has been much more extensive. In fact the scarcity of the lowest qualities has led to such an eager demand that the value, which in the previous year was 37s. to 50s. has advanced to the extent of 20s. to 25s. per cwt., better ordinary and pale kinds at the same time showing a total rise varying from about 18s. for the former, to 10s. for good Eastern growths. Whilst common descriptions of Plantation produce have participated in the above enhanced currencies, and medium colory to the extent of 10s. to 13s. the advance in better qualities is gradually less, until in the best there is but slight alteration.

The total imports of coffee into the United Kingdom exceed those of last year, which was the previous largest quantity recorded by about 0,250 tons, fully two thirds of which consist of Foreign.

Export deliveries have however increased in a much larger ratio, and the total shows an excess of 13,700 tons, bringing it to 78,000 tons, being the heaviest amount ever known. The slight improvement in the home consumption which occurred in 1870, has been sustained, and a further enlargement may be established. These movements have caused a reduction of about 7,000 tons in the stock, Foreign being 3,000 tons and Colonial 4,000 tons less than at the close of 1870.

Ceylon Plantation.—1871 opened with a decided advance for Plantation of about 3s. per cwt., which lasted till the end of February; good to fine middling 75s. to 80s. middling colory 68s. to 72s. per cwt. At the end of March and throughout April prices receded to about 1s. less than opening rates. During May there was a general but not very decided improvement, and the market remained steady at fixed rates. A firmer tone prevailed during July, without much alteration in prices, but in August the reports of deficiencies in Ceylon and Brazil crops being to some extent confirmed, and the European stock being some 11,000 tons short, a very decided rise of say 3s. per cwt. was established. A shortness of 7,000 tons only from the East Indies of advice contributed to this result. Middling colory 69s. 6d. to 74s. per cwt. There were some fluctuations in September, but the general result was a slight advance on previous monthly rates. In October the continued effect of unfavourable reports from Ceylon and Brazil, with the lowness of stock and large amount of export deliveries, caused a further advance of from 1s. to 2s. per cwt., and from the same causes a similar advance was established in November for middling qualities, and a still larger increase for common qualities. The market closed very firm in December with prospect of further rise: good to fine middling 75s. 6d. to 78s. 6d.; middling colory

73s. to 75s.; low middling to middling greyish 70s. to 73s. per cwt. The total improvement for the year has been for middling qualities about 8s. and for common from 5s. to 8s. per cwt., while for triage, &c., 10s. to 12s. per cwt.; advance has been established.

CEYLON, NATIVE.—A good demand was experienced till about the beginning of March, at prices 3s. to 4s. above those at the commencement of the year, good ordinary 55s. 0d. to 56s. 0d. Throughout April and May the market was dull, with a decline, as in the case of Plantation, to about 2s. below opening rates. In June there were large transactions in anticipation of increase in the French duty, and prices advanced, good ordinary 54s. 0d. to 55s. 0d. The actual increase of duty rendered the market dull in July, but in August there was an improved tone with a rise of about 1s. to 2s. per cwt. In September there were large transactions at a further increase of 1s. and in October a most active demand with an advance of 3s. to 4s. per cwt., owing principally to the deficiency in amount afloat from Java and in the quantity offered at the Dutch sale; ordinary and good ordinary native 60s. to 62s. There were slight fluctuations in November, but a good business was done at an increase of 2s. per cwt., and prices during December continued to rise, although until towards the end of the month there was comparatively little business done, good ordinary closing at 67s. to 68s. per cwt., showing an advance of about 15s. per cwt. on last year's rates.

MOCHA.—The imports have been very large this year (consisting chiefly of greenish sorts), being some 3,100 packages in excess of last year, and 5,844 packages in excess of 1869. Large supplies were offered in January and sold at easier rates, ordinary greenish short berry 84s. 0d. to 85s. 0d.; greenish 87s. 0d. to 89s. 0d. per cwt. In March long berry declined 5s. to 6s. per cwt. With the exception that in June and August there was a better demand, the market has been dull throughout the year with but slight fluctuations upon opening rates.

OTHER EAST INDIA.—Foreign as well as Plantation has followed the course of other kinds of coffee. In January Bonthyne was sold pale to good fine bold at 58s. 0d. to 63s. 0d., in May and June declined good pale 50s. to 60s., in September advanced to 65s. 0d. to 68s. 0d. per cwt. Manilla in June sold pale to good pale 55s. to 57s. per cwt. In October was quoted 60s. to 64s., and closed in the beginning of December at 65s. 0d. to 66s. 0d. per cwt.—*British Trade Journal.*

THE COFFEE-LEAF-DISEASE.

(From the Ceylon Observer.)

DEAR SIR,—Enclosed herewith I beg leave to send you a small portion of what was, when cut apparently, a young vigorous coffee branch, with a springing blossom, and leaves large and strong but well-marked with leaf-disease. This fragment has been split up lengthways through the centre, and if you examine it you will find, unless it has withered into general discoloration, that the pith is dotted with little slatey brown spots evident signs either of disease or decay. I have now split up a good many young branches diseased in leaf, and found that at least one in every three had these pith spots. These branches were either secondaries or tertiaries, and the younger portion of the wood usually had externally a slight tinge of yellow. The spots are mostly observable at or near the points from whence the diseased leaves spring, are sometimes single, sometimes in a series, and from say one to three-tenths of an inch in length. I have never been able to detect any of the red powder.

It will be interesting to ascertain whether any of your planting correspondents have detected these diseased pith spots, for the matter now seems to assume a most serious aspect. It is true that my estate, otherwise a good one, has been sadly ravaged by this new scourage, and that many branches having diseased leaves have still to all appearance a healthy pith, yet I fear we shall find that this so-called leaf-disease or its effects at any rate when severe, are much more deep-seated than many of us care to believe. As results of excessive leaf-disease I find that branches entirely deprived of their leaves from disease and wind, blacken, and die in from their extremities, and when partially denuded, that a good deal of the blossom, a higher percentage than usual, fails to come to anything. The trees exhibit little inclination to grow young wood, and even after a light pruning are so thin that the coming crop *must* be affected in quantity, and probably in quality. As a partial remedy I can only say that heavy pruning seems to stimulate a tree to throw off the disease more or less at least for a time. I think there is a general opinion, and such has been the experience in my district, that the parts of an estate, most exposed to the north-east monsoon, have been the first and the most to suffer. But I think where there is little or no wind to blow off the diseased leaves and afford room for new foliage, that the ultimate results to the coffee-tree itself may be very fatal. The spotted leaves hang on till every leaf becomes affected, and each leaf is not merely spotted, but assumes a yellowish red colour all over, and when vegetation acquires such a hue, we know that the leaves acting as lungs cannot properly perform their necessary functions. I am, yours truly,

ONE INTERESTED IN COFFEE.

THE COFFEE-BLOSSOMING TIME.

(From the Ceylon Observer.)

SIR,—The season this year form[illegible] fine, but everyone who has been a resident for [illegible] in Ceylon must feel that they cannot [illegible] that it is a most unnatural one, and bids fair to compare [illegible] ly with its two disastrous predecessors. Where are the [illegible] mornings and hot dry days of yore gone to? Now-a-days one fine day is enough to produce a sensation that it is going [illegible] to rain in torrents, and instead of the old *dry* [illegible] stalk about in an atmosphere natural only to a laundry [illegible] partment. I believe that some people have held the theory that a wet spring does not matter, provided the state is in strong [illegible] tion, but the result of the two last wet seasons must have [illegible] that argument I should imagine. We all know now what the inevitable result, should this spring be a wet one, will be, and certainly the prospect is becoming desperate. At the present moment anything more villainously and hideously unnatural than the appearance of the sky over the mountains near and far cannot well be. This year the atmospheric influences, which began their work of destruction last year in March, appear to have set in already. Under the circumstances would it not be a proper suggestion to make to the clergymen of the different churches that public prayers be offered up for seasonable weather, and that the impending ruin of the colony may be averted. You will smile perhaps at this serious view which I have taken of things, but how many people are there in Ceylon at this present moment who I am sure silently share in this gloomy view, and who lie awake at nights through a tormenting anxiety. We have had a most brilliant beginning this year and one which has raised peoples' hopes, as few can remember such an early quantity of bud as was to be seen;—but rain and stewing weather now having set in, latent blossom is being checked. Last year had the same magnificent prospects and early blossom shewing until March came, when a failure of this year's crop through a wet spring will convince people that it is not the fault or the age so much of the tree, but that it is consequent upon the change in the *spring* season of Ceylon that disaster has overtaken the coffee enterprise, and it will moreover convince those who will not be already done for, that the safest plan for them to adopt will be gradually to abandon and work out of coffee and an ungrateful land. Previous to two years ago such a thing as a wet spring never occurred to anyone's mind, but all this has now changed, and the spring seasons lack the qualities which they once possessed for fostering the formation of coffee blossom. I could shew you acres and acres of coffee *full* of rich wood, which is checked by growing weather, and to calculate the thousands of pounds which have been sunk in manure—the excellent wood produced thereby being rendered valueless—is tantalizing in the extreme. I remain,

DESPAIR.

P. S.—Mr. Buchanan's remarks on manuring are sound, but totally impossible. Most of us have long been aware of the fact that "bulk" is the proper thing for coffee, but *that* which we have yet to learn and which Mr. B. by divulging will confer a boon, is, how a coff[illegible] estate is to be kept in existence by its pulp and cattle manure. Now-a-days one third of an estate requires to be manured yearly, and how is this to be done with pulp and cattle manure irrespective of the query about the transport of pulp and cattle manure from their respective depots to many places ranging from one to three miles. Some gentlemen are to be found who will inform on—with the most perfect nonchalance—that they manure 60, 80, or 100 acres a year with cattle manure and pulp. An acre of coffee may be smaller than I imagine it to be, but somehow, notwithstanding that I always have a good deal of pulp, and though I still feed a great many head of cattle all the year round, I can never succeed in making my manure go over more than half the ground which other gentlemen say they do, although I may have more pulp and more cattle manure than they have.

[Our correspondent does not mention his district, but we observe that a Deltotte correspondent bears him out so far as unfavourable weather experienced in the early part of last week is concerned. Every other report which has reached us is very hopeful of the prospects. Reliable authorities consider that the crisis which only arrived in March last year has been paralleled already during this season, and that a fair average crop over the coffee districts generally, may now be looked upon as a sure. We trust it may be so, and that "Despair" will soon see occasion to change his tone. Prayers for seasonable weather during the coffee-blossoming period might well be offered in places of public worship in Ceylon, as well as for the safety of the grain harvests.—ED. C. O.]

LIQUID MANURE.

(From the Ceylon Observer.)

MY DEAR MR. EDITOR,—Nothing in my opinion requires more consideration on the part of the planter of the present day than manuring: much money has been spent in manure of late years, and that with such indifferent results, that it is quite time that that cause and effect were looked to. Had we not seen the effects of frequent applications of artificial manures, so largely composed of minerals, the nature of these manures, and of the soil, and what we require from the soil, would teach us that these manures should not be applied at random, nor without due consideration. Soil and climate differ so much in different districts that no general rule can be applied, and I think a suggestion was made some two years ago, for the Planters' Association to appoint men in each district, to see the different kinds of manures most in use applied, and to report annually each month all [illegible] that might be useful or interesting, and that a committee of these gentlemen of two, three or four districts might meet quarterly and report collectively, and these gentlemen might be

[illegible] and manures analysed, and any [illegible] found necessary for the [illegible] number might be dispatched [illegible] and [illegible] of [illegible] a [illegible] consuming amount might be so [illegible] to [illegible] to [illegible] now [illegible] manures, indeed injuriously. I believe, [illegible] would be found in most coffee districts, to [illegible] proposed. I leave out the consideration of [illegible] allowance that might be required for actual or [illegible] which might be incurred by those gentlemen's [illegible] That would be so small that the Planters' Association [illegible] no difficulty in arranging it, and if we come to know [illegible] these matters, what manures, how, where, and when to [illegible] them with some certainty of a reasonable return, it would be [illegible] well-spent.

I perfectly agree with "Orum," when he says "and has not manure been spread literally over Ceylon till the coffee-tree seems to enter a mild protest against the useless extravagance." This is well said, and will be considered by those who have spent their hundreds unthinkingly, and find it returned in less than tens. I would not have you think that I disapprove of manuring; far from it, we wish to cultivate, and we cannot do so without manure, but what I disapprove of is applying stimulating manures to soils that only need feeding, and feeding manures where only some minerals are needed to throw loose the nourishing ingredients native to the soil. "Orum" is again right in the matter of applying manure to the surface. A great deal of manure has been lost by being put deep in the ground, and how much a sensible man as "Orum" appears to be, should not agree with me about wash-holes, I cannot understand. Why should "Orum" have lost sight of the old say—"good for the goose," &c., &c., and not apply his drains to the field with wash-holes, as he did to the manured one? And let me give him a *wrinkle* in surface manuring, let him apply his basket of manure or his pound of compost, well-spread round the root of the tree, and then send his boiers to cut a shallow hole, say 2 feet by 2½ feet and 6 inches deep, between every alternate tree, throwing the earth taken out of the hole, on the top of the manure round the roots of the two nearest trees, covering the manure thoroughly with it, and then see to good drains being cut, drains not 1 in 17 as "Orum" prescribes, but say 1 in 12, and it will be possible to keep them open. In the case of drains with a gradient of 1 in 17 it is hardly so.

A drain bursting near the top of a field, (and drains of the gradient intended by "Orum" are apt to do so), will choke up all drains to the bottom of the field, and then drains are worse than want of them, but with your manure well-covered round the roots of the trees, and your water holes formed by cutting out the earth to make this cover, ready to collect all weeds, leaves, and prunings, with drains 1 in 12 well-cut, and cleaned out regularly along with the weeding, your manure will be at peace. No harm will result from roots, or rather rootlets being drawn to the surface, indeed I think little is to be feared from this, for manure protected from wash and evaporation, as all manure should be, will soon sink deep enough, creating rootlets as it goes. I am sorry to disagree with "Orum" about the wash-holes, but I think them an essential part of a well-cultivated field, not so much for the sake of preventing wash of earth, which can be better done by thorough draining, but to prevent waste of vegetable matter such as weeds, leaves, prunings, and any kind of vegetation that may be about, and these when husbanded in this way, with the little earth that will always be washed in with them, make the very best of manure in my opinion.

And now, Mr. Corbet, I fancied we should be one in everything but no, after another perusal I find the spirit of contradiction strong upon me, the weather may have something to do with it. A wet season or rather a succession of wet seasons must be injurious to soils like Dimbools and Dickoya, where the want of stones to create a natural drainage, and a stiff subsoil prevents the water from sinking down so fast as it need do, and by its accumulating in the subsoil sour it. Soil occasionally wet and occasionally dry, will improve in quality, turning blacker and more friable, while soil kept continually damp will turn into stiff clay. So the want of natural drainage must be injurious to the coffee-tree. At first sight Mr. Corbet's plan of furrow draining (for it is evidently furrow drains Mr. Corbet means) is the right thing to do. I have often thought of furrow draining, and thought how good a thing it would be to furrow drain a stiff-bottomed field, and have even tried it on a small scale, but, as I expected, could not afford to do it with coolies. Coolies do most things necessary on a coffee estate cheaper than European labour could accomplish the same task in their own country, most kinds of work at 50 per cent. less than such work would cost in England, but not in cutting deep drains, that is a kind of work coolies will never be able to do at a reasonable rate. Furrow draining is thoroughly understood in England and Scotland, in Scotland more especially, and in furrow draining some rules are thought absolutely necessary to be followed in all kinds of furrow draining to ensure their answering the purpose for which they were intended, viz., the subsoil. The first of these rules is to place the drain up and down the hills and not across it, as by placing the drain across the hill, it will leak as much by the under side as it will drain from the upper. The second rule is that the depth shall correspond with the distance apart, as 3 feet considered sufficient for drains 1½ yards apart. The third is that the drains be properly filled in, the bottom being provided with small stones, tiles, timber, or whatever may be considered most expedient, this not being considered of so much consequence as the careful covering of the under layer with broken metal and over that a thatch of some kind to prevent earth from getting into the drain; water only may drain in below, but over this water must be prevented from getting into the drain by the surface, and to prevent this, properly-worked clay must be put over the thatch and properly beat down, and then the cutting filled up with earth rammed down, and the remaining earth spread over the field, and the furrow drain may be said to be finished. But another rule is, that all furrow drains be emptied into a leader properly built and not into any open ditch.

These rules, Mr. Corbet will have to be complied with, to ensure success in draining. And what will be the cost? An acre of coffee will require about 200 yards of drains, and a coolie, after some experience (he need be a 9d. one) will cut about 1½ yards a day, 133 days at 10d—£6-10-10. Filling in will cost,—collecting stones or timber 1½d, preparing and putting in 1½d, claying and filling in 1½d = 4½d. per yd., filling in, or per acre £3-15-0, and then 24 yds. of leader drain will cost 1/6 per yard £1-10-0 in all, £12-1-10 per acre. You may say you can do it for less and can dispense with filling in, but unless the drain is kept properly clear it will not act, and if it be possible to keep a furrow drain clear without covering it, it will be at a cost which would soon cover the expense of filling in high as it is. If draining could be done properly at a fourth of the money, then ye men of Dimbools and Dickoya do it, but I do not suppose you are prepared to spend from £13 to £14 per acre on it. Cutting drains three feet deep, and leaving them open will be so much money thrown away except for surface. Instead, as transport from Colombo gets cheaper, send for quick *lime, lime* mind you, not chunam, which is little else but magnesia, good medicine sometimes, but indifferent manure, and apply the lime immediately after it is slaked, see they do not do that for you in Colombo, apply it to the surface and to the tree. Liquid manure, that's the thing when cart roads are at reasonable distances apart, and a small cart road will be sufficient for the purpose. It can be applied at half the cost of cattle manure and with greater benefit. So cut cart roads, build sheds, buy cattle, and plant grass. Build a tank to hold 5,000 gallons of water, buy 400 gallon casks, build 4 small carts to carry them, taking down your 6 feet spouting and add a hook, and a few links of chain, and then convert all your manure, and all convenient animal and vegetable matter, good for nothing else, into liquid with vitriol and water or anything else you can do it with, and then with one cooly to scrape a small hollow round the tree, to hold a gallon of water, to be sent down by measure from the cart, and another to shift the spouts to another line of coffee, as they have done their duty, and other two coolies to attend to the cart and bullocks. These four coolies will manure half an acre per day. You will be able to calculate the cost, and see how small it is. Manure applied in liquid will go much further than when applied in bulk, and by making all your cattle manure into liquid, keeping cattle will pay. I would tell you more about this manure, but would much rather hear others on the same subject.

RAMBODDA.

NOTE.—We wish our correspondent had entered on the question of the cost of applying liquid manure. The benefits are undoubted but—the cost?—Ed. C. O.

HEMILEIA VASTATRIX, BERK. AND BR.

Otherwise,

"LEAF-DISEASE, COFFEE-LEAF FUNGUS, COFFEE-LEAF DISEASE, FUNGUS ON THE COFFEE-TREES."

To the Editor of the Ceylon Observer.

"THE wild assertions some people make would be amusing if they were not more or less misleading and mischievous."—From extract of letter of Director Royal Gardens, Peradenia, in *Observer*, of 20th January 1872, on the Fungus on the Coffee trees.

Colombo, Jan. 23rd 1872.

DEAR SIR,—The extract of a communication from Mr. Cochrane and Dr. Muter on the above subject in your last issue, proves how necessary it is to reiterate certain *facts* to certain people, and if necessary to hammer them into their heads. Your own columns will shew that the *Ceylon Observer* has kept your planting friends fully up to every point in the history of this latest enemy of the coffee-tree since it was first noticed until now. On the 29th of May 1870, you extracted from the *Gardener's Chronicle* a full account of this fungus from the pens of the Rev. Miles Joseph

Berkley, M.A., F.L.S., &c., and Christopher Edmund Broome, Esq., F.L.S., both of whom are, I believe, admitted to be the best authorities in Britain on the subject of Fungi, and are now describing the Fungi of Ceylon, of which more anon.

I send you from my file of the *Ceylon Observer*, the very appropriate and scientific accounts of this fungus which appeared in the *Gardener's Chronicle* from the pens of Messrs. Berkeley and Broome, with some popular remarks by the Rev. Mr. Berkeley, and leave it for you to say how far you feel inclined to reproduce these for a third time in the columns of the *Observer*, but to prevent a repetition of unnecessary trouble and expense in sending any more specimens of this fungus to get useless guesses at its origin, and what should be done to prevent its spread, on the supposition that it may be the produce of "*Pollen from some greenish, yellowish flowers*," I take the liberty to send you the full description of this fungus to be printed as follows:—

Generic description.—Hemileia, Berk, and Broome. Sori somewhat circinating hypophyllous, naked; flocci distinct, inarticulate, flexuous, spores somewhat kidney-shaped at first smooth, then granulato-verrucose on the side, attached obliquely at the base by a little papilliform point.

Specific description.—Hemileia Vastatrix, Berk, and Br.—Forming little white orbicular patches on the under side of the leaves, consisting of tufts of flexuous threads surrounded by a single subreniform spore attached obliquely at the base, rough externally with wart-like papillæ, quite smooth on the side nearest the flocci.—The upper portion of leaf above the patches looks as if it were burnt.

Our figure represents a group of threads with young immature spores highly magnified, together with one of the tufts as seen from above, and spores in different positions.

From the article in the *Gardener's Crouicle* it appears that Mr. Thwaites first noticed a few (coffee) trees to be infected with fungus, in May 1870, and when he wrote to Messrs. Berkeley and Broome on the 24th of July following, two or three acres were showing the fungus upon the leaves. Now I believe that it would be of some importance to find out from Mr. Thwaites and the Superintendent of the estate all the facts they can put together respecting the history of manuring, &c., at this spot where the fungus was supposed to have commenced to spread. What manures were used, and is it likely that the spores of this fungus may have been introduced in foreign manures, and from them, found a congenial medium on which to vegetate and spread on the leaves of the coffee-tree, &c. You will perceive that out of more than one thousand species of fungi received from Ceylon, Messrs. Berkeley and Broome saw nothing like the one under discussion.

If it should be asked, *cui bono* is the study of such *vile jellies* as some of the fungi, this discussion itself proves how very important it is to have every one of them properly and scientifically described, and to shew your readers what is being done in respect to our Ceylon fungi, I beg to send you the No. of the *Linnean Journal* for May last, from which you may I think quote the following introductory remarks with advantage as bearing on this subject:—

The fungi of Ceylon. By the Rev. M. J. Berkeley, A. M., F. L. S., and C. E. Broome, Esq., F. L. S. (Hymenomycetes, from 'Agaricus' to 'Cantharellus'). [Read June 16, 1870]. The materials in our possession, beside others to which we have access, are very considerable. We possess almost a complete set of those which were collected by the late Dr. Gardner; those transmitted by Mr. Thwaites comprise more than twelve hundred numbers, above three hundred of which have been beautifully figured; while those of Dr. Konig, preserved in the British Museum, have already been described by one of us in the 'Annals of Natural History.' Any general observations on the fungi of Ceylon had better be reserved till we have had the whole collection under review; but meanwhile, as far as regards the species described in this first notice, it will at once be remarked how closely the Agaricus, which comprise 302 species, resemble those of our own country. Though many species do not seem to be identical, still we have frequently had great difficulty in accurately estimating the difference. It is singular that every one of the subgenera of Fries is represented, though the number of species in one or two is greatly predominant. 'Lepiota' and 'Psalliota' alone comprise one-third of the species, while 'Pholiota,' which one might expect to be well-represented, offers only a single obscure species. It has frequently been a matter of doubt whether particular species should be referred to 'Lepiota' or 'Psalliota,' since the colour of the spores sometimes changes in drying with the rest of the plant. We have therefore been obliged to be guided by what we know of European species, having merely drawings and dried specimens to help us. If therefore we have in this case committed any errors, they must be left to the reconsideration of Ceylon botanists with fresh specimens before them. As the drawings will hereafter be returned to Ceylon, careful copies being reserved for this country, there will be no want of materials for the purpose. The figures have been made under the superintendence of our indefatigable friend, Mr. Thwaites, by a native artist (Mr. De Alwis), and are admirable, both as to execution and details. Indeed it would be difficult to point out any which [illegible] stringent requirements, with [illegible] matters, which in under [illegible] caution perhaps may be [illegible] being derived from the Greek [illegible] the great point was to avoid the [illegible] already appropriated, a matter of extreme difficulty [illegible] help of the best published lists. It will be well indeed if we have not sometimes suffered wreck on a rock [illegible] Specimens of a few of the more striking drawings have already been laid before the Society; and it is a matter of regret that it is simply impossible to publish the whole series. The copies however will ultimately be deposited in the Library at Kew.

With reference to the *diseased leaves of the Mallow* referred to in a No. of the *Australasian* kindly sent to you by a gentleman, under the impression that it is the same disease which affects the Ceylon coffee-plants, it has been proved that the Australian disease is caused by an insect—a species of Cynips—and cannot therefore be a fungus; but the fact stated by Mr. Thwaites in a late No. of your paper, that he did not detect the disease even on such closely allied plants to the coffee-tree, as the *Ixora* or *Pavetta Indica*, goes to prove that it is not likely that the *Mallow*, a plant of a widely separated order would be affected by coffee-leaf fungus.

In a letter from the Director of the Royal Gardens, Peradenia, dated 22nd instant, are the following remarks on this pest:—

"Our coffee-trees here have still the disease upon their leaves, but it does not exhibit that very active vitality it did upon its first attacking the trees, and I am in hopes it may have assumed a slow chronic growth that would be far less injurious to the coffee plant, and especially where the latter may be favourably situated as regards its own growth. Time alone will shew whether those hopes are well founded or not."

Hoping the importance of the subject under discussion will justify you in occupying so much of your space as the foregoing.

Yours,
W. F.

MARKET REPORT.

LONDON, 15th February 1872.

COFFEE.—The parcels of plantation Ceylon brought to public sale to-day went off briskly at fully previous rates, but prices of native Ceylon were barely supported. 420 casks, 40 barrels, and 100 bags plantation Ceylon all sold,—triage and ordinary, 68s. to 73.; small to low middling grey, 74s. to 79s.; middling to fine middling, 79s. 6d. to 88s.; bold, 90s, peaberry, 88s. to 92s. Of 800 bags native Ceylon, 500 sold—good ordinary greenish, 70s. to 70s. 6d.; bold, 72s. 6d.; and 210 packages Jamaica, ordinary to good ordinary, 69s. to 70s. 6d

SUGAR.—The sales to-day are limited, and prices have still a downward tendency. Privately, 70 casks Jamaica sold at 30s. to 30s. 6d.; 400 bags Penang, soft brown, 26s. to 26s. 9d.; and 2,700 baskets Java for export, grainy, at 26s. 6d. Of 9,000 bags and pockets Manilla offered by auction, about 1,000 packages sold, low grainy, 24s. 6d. Refined—quiet, at yesterday's currency.—*Home News.*

CALCUTTA, 1st March 1872.

INDIGO.—Season '71-72 is now closed, no public sales have been held during the week, and it is expected that what little still remains on hand will be disposed of privately. It is probable that the crop will weigh out 95,000 maunds. Crop '71 has been disposed of in the following manner:—

Shipments from November 1st 1871 to February 29th 1872: —Season '71-72.

Great Britain	8,000 Chests.
Germany, Holland, & Belgium	5,800 "
France	4,250 "
Russia	4,050 "
America	1,650 "
Suez & Gulphs	800 "
Italy & Switzerland	400 "
Total	23,950 Chests.

INDIAN TEA.—A moderate business has been transacted during the week. Two public sales, held on the 24th & 29th ultimo, comprised 2,531 packages, of which about 1,850 changed hands. The auctions passed with better spirit than of late. Common kinds were rather dull of sale, but medium and fine descriptions met with an improved demand at advanced rates. London telegrams dated the 31st ultimo, quote the market very flat; offered 2,500 chests—sold 1,100.

BENGAL SILK.—Sales during the week total 128 bales, for all that there is little or no life in the article, and a few shippers only make a free under an impression that when things come to the worst they must soon mend,—and really Bengal silk has been unsaleable for so many months that the turning point would seem inevitable but for the heavy stock held in London; but with such a [illegible] operations in the fibre are purely speculative if not dangerous. The [illegible] Bund is coming in slowly, being held back purposely with the view of [illegible] for better prices, but such a change is highly improbable as long as there is the least chance of a way between Great Britain & America. Unsold stock on the spot 200 bales, with large quantities in the producing districts.

JUTE.—Values have ruled lower during the week for all qualities, and sales effected at decline of Rs. 1-8 per bale from the [illegible] ago. This depreciation resulted from heavy [illegible] information that the stocks in the growing [illegible] than was expected by anyone during the [illegible] on a large scale for so late in the season, and it [illegible] that the out-turn will total 1,500,000 bales. [illegible] shippers, and not unlikely will decline [illegible] districts during the week [illegible] time—25,000 bales. Unsold [illegible] per B. maund [illegible] Dues, Rs. [illegible] *Pa's Circular.*

THE

SUPPLEMENT TO THE
"INDIAN ECONOMIST."

Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

VOL. III.] BOMBAY, MONDAY, 22ND APRIL 1872. [No. 9.

Agricultural Gazette of India.

CONTENTS.

LETTERS TO THE EDITOR.

POULTRY BREEDING.

To the Editor of the
Agricultural Gazette of India.

SIR,—Few people I imagine are aware that keeping English poultry, and especially fowls, in this country, is not half so impossible an undertaking as one is usually told. Everybody complains of the scraggy jackdaw-like creatures, and the dirty tasteless pigeon's eggs which one has to put up with, when the bazaar is indented on for fowls or eggs, but one seldom hears of persons attempting to remedy matters by breeding European birds for themselves. And yet it is neither impossible nor unprofitable. On the contrary, a four years' experience has proved to me—and one example is worth a bushel of precept—that English fowls can be imported, kept, bred from and made to pay, with not more trouble certainly than one has to take with a well-kept poultry-yard at home. The kinds I have found to pay best are the non incubators—the act of setting involving a kind of fever which appear to be more or less injurious to English birds out here. An admirable cross is one between Spanish and Silver Hamburgs; another is between Hamburgs and Bantams. These lay incessantly, never set, and are very handsome. The various Cochins too thrive well, though better if crossed with some lighter breed. The great fancy cross called Brahmahs, which is got from breeding in and in between Cochins and Dorkings, thrive well. The Bussorah fowls too cross well with English. So do of course the common native fowls, as well as the kalaes or fighting breed, so prized by Mussalmans, but these one reverts to small eggs, poor flavour, and craves to incubate, which sometimes lasts for six weeks together. Fowls from England can often be got from newly-arrived vessels. The secret of keeping them is to keep them clean, with plenty of shade and water—a free run and mixed food, *e.g.*, meat, grain, and vegetables. X. Y. Z.

MINERAL AND SALINE MANURES.—IV.

To the Editor of the
[illegible]

[illegible] maize, [illegible] or; [illegible] or *Jow*; [illegible] gram, chick-pea, (*Cicer Arietinum*) or *Chunna*, and rice. Oats are grown to order, exclusively as horsefood. The zemindars have named the oat *Billaitee Ja-oe.*

I intend taking no notice of the inferior food grains which, though capable of improvement, are not worth the trouble of superior culture. With the exception of rice, all the other cereals contain more or less sulphuric acid, but in considerable proportions, as compared to wheat. Common salt contains *chlorine* in combination with soda, whilst these crops require that alkali, in union with sulphuric acid.

The enlightened British Farmer has to go to the Agricultural Chemist for the sulphate of soda, which consists of sulphuric acid and soda. We are told by Professor Johnston that 40 lbs. of sulphuric acid, and 31 lbs. of soda form 71 lbs. of the dry sulphate of soda.

The *Kharee-Neemuck*, or crystallised sulphate of soda, of the Indian bazaars, contains 44¼ lbs. of the dry sulphate of soda united to 55¾ lbs. of water, and constituting one hundred pounds of the commercial article. In this form it does not contain an atom of salt, but like saltpetre, its adulterant is culinary salt, which is eliminated by crystallization. The excise by taxing the adulterant, raise the price of this sulphate far above its actual value, and as a natural consequence, it is much too expensive to be used for any but medicinal purposes. It acts on sheep and cattle as a scouring purge, and on man as a cathartic. The value of this salt as a manure is unknown to the zemindar and the excise, from whose grasp improved agriculture will demand its release.

The impure carbonate of soda, or *Sujjee-Mittee*, appears as an efflorescence in certain soils and localities, and it acts as a fertiliser, from it under excise restrictions: the crude carbonate of soda, of the bazaar, called *Sujjee*, is manufactured, and when this is purified we obtain the *Goolunbee or Loutun Sujjee*, used in the manufacture of country soap, and the native glass called *Kaunch*, with which women's bangles (*Choories*) and small and large hair oil phials and rose-water carboys are made, as also Delhi and Lucknow pickle jars, and illumination lamps.

The collected efflorescence is employed by the Indian washermen in cleansing the oily and otherwise abominably filthy garments of their high and low caste employers.

Its use as a manure is unknown, though it is of great value for all crops needing soda without the presence of chlorine or sulphuric acid.

The *Nitrate of Soda*, is the last saline manure, kept out of use by the department. It consists of nitric acid and soda;—"54 lbs. of nitric acid, and 31 lbs. of soda, form 85 lbs. of nitrate of soda, and one hundred pounds of it contain 16½ lbs. of nitrogen." It is a fertilizer and contains no common salt, the excise have confounded it with *Natron*, which always contains salt, and very much resembles the sterilising salt, so much dreaded in India, under the name of *Rhur*, and *Kuller*. This substance exists in certain subsoils. Such lands though originally fertile, have when over-irrigated (by an abuse of canal water) become barren in consequence of the *Kuller* rising from the subsoil to the surface by capillary attraction. At present the *Kuller* is looked upon as a curse, following in the wake of canal water, but when saline manures are restored to freedom, the curse will change into a blessing, as the *Kuller*, when properly manipulated, will yield three saline manures, viz.: the muriate, carbonate, and sulphate of soda.

For the sake of comparison I subjoin an analysis of each;—

Natron consists of—		*Kuller.*
Carbonate of soda	22·44	26·67
Sulphate of soda	18·26	34·64
Muriate of soda	30·64	26·22

I believe in some localities magnesian salts are also present in the *Kuller.*

The last saline manure (No. 6) is sal-ammoniac or *Nowsadur*, and it is of remarkable value for certain highly remunerative crops. First class tobacco, beet, mangold wurzel, cauliflowers, cabbages, peas, beans, spinach, and all plants having thick succulent leaves, cannot be produced without its aid. The ammonia it contains is fixed, and when this salt is dissolved in water, and the solution applied to farm-yard and vegetable manure of all kinds, the compost when so prepared and used causes the roots, leaves, and seeds of the plants named to be of the highest quality.

If we dry and burn 100 ounces of first class tobacco leaf, 25 ounces of ash will remain, which the growing plant has taken out of the soil; hence tobacco is the most exhaustive of crops, and requires very high manuring. The tobacco plant possesses the remarkable property of converting ammonia into sal-ammoniac. The manure used for tobacco is night-soil, which contains culinary salt and ammonia.

If the reader will take a green tobacco leaf, and reduce it to a paste in a porcelain mortar, and add a salt spoon-full of lime or chunam thereto, and mix them together, the peculiar smell of snuff will be evolved, and if he will then hold a feather dipped either in vinegar or

dilute muriatic acid over the paste, the white fumes or clouds will appear, proving the presence of sal-ammoniac in the leaf, the fixed ammonia, having been set free by the lime. Hence the practical farmer learns, that to grow superior tobacco, sal-ammoniac is one of the saline manures which must be freely used in addition to saltpetre, and sulphate of soda, all these crops require phosphate of lime as well as the the carbonate of lime and magnesia.

If magnesian limestone is not available, steatite reduced to powder will have to be used, but if calcined magnesian limestone is procurable, one part of it should be mixed with three parts of common lime, or *Kunkur* dust, and the mixture applied to the soil as manure.

Magnesian limestones contain from 42 to 45 per cent. of magnesia with from 55 to 58 per cent. of lime.

Steatite or soapstone, always contains 44 per cent. of magnesia, and in addition 7·30 of iron and 1·50 of manganese, but of *lime* there is only a trace. Hence for every pound of steatite used, three and-a-half, or four pounds of *Chunam* lime, or *Kunkur* dust should be mixed with it in the dry state previous to application. The calcined magnesian lime, should always be slaked with water holding sulphate of soda in solution, and when the steatite powder is employed, the calcined carbonate of lime should be similarly slaked.

For wheat crops either magnesian lime, or steatite should be used in the presence of crude sea salt, as 33·9 parts of it contain 8·9 parts of magnesian salts. But if such salt is not procurable, then the magnesian lime, or steatite and lime should be slaked with culinary salt.

In the Himalayas, decomposing magnesian limestones are not uncommon, its colour is pale yellow, and dull buff. The frost causes it to fall into powder and grit, and being soft it may be easily pounded, when it will be ready for use without calcination.

The supply of alkaline and saline manures being secured, all the indigenous crops may be raised to perfection. Farm-yard or vegetable manure if available should be used, being applied as before to the young crops of maize, large millet, *Joo-ar*, barley, &c. The ploughing should be deep, and the seeds of maize, and *Joo-ar* should be sown at intervals of two feet, with a space of 2½ feet between row and row. All plants require breaking, as well as elbow or growing room, and the freer the circulation of air, the better the health of the plant, the more vigorous its growth, and the greater the amount of produce.

All seed drills should run North-east, and South-west, never due North and South. Maize, Indian corn, potatoes, pumpkins, peas, beans, &c., grow vigorously towards the North-east and South-west, less vigorously, towards the South, and least towards the North. The *Bajra* or spiked millet affords very good green fodder, and the grain, though not at all to be compared to the large millet, is eaten by the natives. It is deficient in nutrition, cheap, nasty, and plentiful, three good reasons in the eyes of the ryot and zemindar for keeping up its cultivation. It is plentiful, because in large towns and cities, none but the poorest classes eat the cakes made out of bajra-flour.

False economists, European and Native, give *Bajra* to their poultry, on account of its cheapness, and cannot make out why the hens won't lay, keep out of condition, and die of the Pip. H.

EDITORIAL NOTES.

A NURSERY garden, to cost Rs. 300 per month, has been sanctioned at Rauneekhet in connection with the Forest Department.

THE *Englishman* offers to show to to anyone who likes to call at its office two very fine specimens of mangold-wurzel grown on the reclaimed portion of the Salt Water Lake. The interest of these vegetables arises from their having been *grown on land watered by sewage.*

ARBORICULTURE has a heading to itself in the Public Works Accounts of the Punjab, and its operations having been supervised by that Department, and the funds derived from District Local Funds under the Public Works control. For the future we learn, these arboriculture grants are to be drawn from the local cess, and the control transferred to the Civil Department.

A "DENDRO-POMOLOGICAL" garden is about to be established at Berlin. The garden will be planted with fruit-trees, and will comprise an arboretum for hardy ligneous plants which will be systematically arranged. Hedges of various plants for live fences will also be introduced. The idea emanates from Professor Karl Koch.

Land and Water writes of a boring beetle found in the Cachar tea-chests, which appear to have come from a place called 'Hairumbo.' The presence of the insect in the tea-chests is, according to our contemporary, a formidable danger, and planters will doubtless recognise the necessity of finding a remedy for the evil.

A ROME journal announces a new flavoring plant for [illegible] ing purposes, the *Cinnarvis* [illegible] tory results have been received [illegible] utility, and if proper attention is paid to its [illegible] pected to become a staple article amongst manufacturers. The seed is imported from France and the South of Europe.

GUANO deposits which are generally supposed to be simply the excreta of birds are now suspected to be the accumulated debris of the bodies of animals and plants—most of them of marine origin. In some places, these deposits are, we are told, upwards of 100 feet thick, and the anchors of ships moored in the vicinity of the Guano Islands frequently bring up Guano from the bottom of the sea.

AMONG vegetable substances useful in the arts, the *Delhi Gazette* mentions one that has been known in New Granada under the name of the ink-plant. This plant furnishes a juice which can be used in writing without previous preparation. Characters traced with it have a reddish colour at first, which turns to a deep black in few hours. The juice is said to be less liable to thicken than ordinary ink.

THE *Delhi Gazette* informs us that Rhea grass, prepared by machinery in the Doon, has been thoroughly tested by spinners at home, and highly approved. They report it better for their purpose than the best hand-prepared grass of the same description from Hankow, giving sixty per cent. of tops suitable for mixing with silk for dress-pieces; and the remainder doing admirably for combining with wools for merinos, while it takes the dye better even than the China produce.

THE Administration Report of Bengal, tells us that the season 1870-71 was favourable to agriculture. The rice crop was specially abundant; the jute crop was fair. The indigo out-turn on the whole was favourable; tea was hardly as abundant as it promised to be in 1871-72, but in oil seeds the yield was unusually large. The *Bengal Times* finds the exports of staple products as follows:—Rice in 1869-70—7,461,000; in 1870-71—8,607,000; Jute 3,439,000—3,343,000; seeds 3,510,000—5,953,700; Indigo 58,842—63,532.

AT the last meeting of the Agri-Horticultural Society, Calcutta, the Secretary read the following communication from Colonel J. B. Thelwall, respecting a peculiar kind of wheat raised by him in the Dehra Doon, from seed received from the Punjab. "I have "about 20 acres, sown with some wheat I originally picked up "in the Punjab. It has a long black beard and pigs and birds "won't touch it; the grain is enormous in size: it is a very heavy "bearing wheat, and produces first-rate flour. I have never seen "any wheat to equal it in any country. If you would like a "maund or so, let me know, and I will send it when we get crop "in."

THE general results of Forest work in Madras during 1869-70, are summarized by our Serampore contemporary as follows:—There were removed from the various forest tracts, 930,010 cubic feet of timber: 57,434 tons of firewood, and 39,913 cart-loads of bamboos. There were prepared 10,504½ maunds of sandalwood, 11,01,700 lbs. of red sanders (a dye wood), and 1,588 telegraph posts. The expenditure of the entire department for the year was Rs. 2,86,091, and the receipts Rs. 4,95,780, showing a profit to Government of more than two lacs of rupees, the largest amount yet realized.

AN old-fashioned Zetland plough is a real curiosity. Lockhart in his Life of Sir Walter Scott thus describes it:—It had but one handle or stilt, and a coulter, but no sock; it ripped the furrow, therefore, but did not throw it [illegible]. When this precious machine was in motion, it was dragged by [illegible] and as many ponies harnessed, or rather strung, to the plough by ropes and thongs of raw hide. One man went before, walking

[illegible]

[illegible] "An antiquary inquires of opinion that the [illegible] model of the original plough invented by Triptolemus."

[illegible] of the Flora of the Kaulai Hills, the *Delhi Gazette's* correspondent says:—"I have heard many expressions of disappointment in having met with so few wild flowers in these hills; violets, pink, little or no scent, heliotrope, and some common flowering weeds, being almost the only varieties we discovered. It is evident that the season was too early for them hitherto, and had we been remaining longer in the country, I expect our disappointment would have been turned to delight. Already crimson rhododendrons enliven the gloom of the forest, a beautiful little green pendent flower hangs in festoons from the trees, large spikes of brilliant scarlet flowers thrust themselves into notice through the long grass and tangled briars, lilac flowers and golden fern spring up along the edges of the road, and butterflies of the brightest and most varied hues flash through the sunlight, all lending additional beauty and interest to our homeward path.

The importations of wheat into Great Britain in the first ten months of 1871, as reported by an American Journal, amounted to 32,905,838 cwt. against 25,309,710 cwt. during the same period in 1870. The Russian contribution was 13,310,475 cwt. against 8,219,154 cwt. for 1870. That of the United States, 10,832,561 against 10,666,001 for 1870. Germany reduced her supply from 3,085,895 to 2,447,356 cwt., France sent 122,004 cwt. against 174,651 in the previous year. Next to Germany, in quantity, came British North America, supplying 2,426,248 cwt. in 1871, and 2,212,723 in ten months of 1870. The United States increased its supply but little, representing 33 per cent. of the whole; but Russia had advanced from 32 to 41 per cent. The average price paid for Russian wheat was $2·64 per cwt; for that of the United States, $2·00, being an increase upon 1870 of 37 cents per cwt. The total money receipts by the United States were, for wheat $32,464,330; for flour, $6,168,680. Russia sent little wheat in this shape; none was separately reported for 1871. The total receipts of flour and wheat meal were but 1,347,001 cwt. The quantity of Indian corn imported in ten months was 14,260,700 cwt., costing $27,340,870.

Various attempts have been made of late towards utilizing cotton seed. Mr. Rose some time ago read a paper on the subject before the British Association at Liverpool, wherein he said that this simple vegetable production which could be supplied to the extent of millions of tons was now wasted. The seed was composed of 50 per cent. kernel, which yielded about one-third oil, and 50 per cent. husk-shell with fibre adhering to it, of which the fibre would be one-third. He calculated that this waste seed would produce 250,000 tons of pure cotton, 250,000 tons of oil, and 500,000 tons of cattle-cake, the value of all which he estimated at £20,000,000 sterling. It is now discovered at Redbank and Ipswich that the hulls and wool can be separated from the kernel, and that the latter is at once available for cattle-feeding. Dairy stocks and pigs eat it readily in the raw state, and so cake still more so. In New York, says an American paper, this cake commands nearly the price of corn, being said to equal it in its fattening qualities. Shipments of the seed have been recently made in great quantity to Liverpool from New Orleans, one vessel taking over ten thousand sacks of seed and about a thousand of cake. The hull of the seed is reduced to pulp for paper manufacture. Can nothing be done in this country to utilize the seed in some way?

The *Medical Mail* publishes a letter from the Superintendent of a Cattle Estate in North-West Wyoming, respecting the "Foot and Mouth" disease, which is said to be raging [illegible]. The [illegible] ed, but through one of the [illegible] recovered, the [illegible] confined to the calf, and the sick cattle were recovering. The [illegible] been inoculated by [illegible] the [illegible]

"The [illegible] is right, but I have proved on my premises a little. The [illegible] was very bad, and [illegible] or cure was the only way; so I 'made a clean' and now it is nearly better, only one calf has died as yet. Now I have got amongst the pigs, even the little ones born three weeks ago seldom have never been away from the Bungalow. It is very bad amongst the cattle in some of the paddy-fields round about. One day last week, when going over the track of the new road, I saw several buffaloes dead in the fields; looked at one and found my enemy had done the deed. The cattle won't touch salt at present; it irritates the sores too much. There is plenty always in their sheds. I make a point of seeing the place is kept supplied. I sprinkle the sheds over every day with carbonic acid and water, and keep the bottle in the shed night and day."

We lately remarked that the Sugar-cane was a common grass improved by care into the modern cane, but having lost all power of reproduction by seed. This fact seems to have reminded our contemporary of the *Bangalore Spectator* of having read in the *Gardener's Chronicle*, some time ago, of an analogous circumstance in the case of wheat by a M. Fabre:—"He found that a kind of wild grass—*Ægilops ovata*—was subject to what is called by gardeners "a sport" *Ægilops triticoides*. Of that sport he sowed the seeds, and he found that while on the one hand there was no disposition to return to its original form, there was a decided tendency to sport still more. Of this tendency he availed himself. Year by year the change went on, but slowly. Little by little one part altered to another, the wretched grain grew plumper; the flour in it increased, and its size augmented. The starved ears soon formed other spikelets, at first containing but two flowers, and then capable of yielding four or five. The straw stiffened, the leaves widened, the ears lengthened, the corn softened and augmented, till at last wheat itself stood revealed, and of such quality that it was not excelled on the neighbouring farms. The experiment was done on a large scale, the result of a farming operation in the open fields."

A Correspondent at the Cape of Good Hope sends to the *Agricultural Gazette*, the following interesting account of Ostrich farming in the colony:—

"I have a flock, or herd, or covey, or whatever else you like to call it, of 27; they are perfectly tame, and will follow me all over the place; in fact, I feel sure that they were always intended to be domesticated. I have only to go outside the door and whistle, and the whole troop comes as fast as their legs can carry them, in hopes of getting some maize which they are very fond of. They eat almost anything, but there is so much round the house and in the old lands they scarcely required any artificial food, but I generally give them a feed of lucerne once a day, and they seem to relish it more than anything else. They are plucked first at eight months' old, and afterwards about every seven months. The first feathers are not of much value, but nevertheless return 25 per cent per annum. The second plucking brings that up to 80 per cent., and the third about 110 or more. The feathers are then prime, and the yield from each bird, taking cocks and hens together, is about £9 or 10. The price of birds, two months' old, is £9 and I intend to make up my number to 45 this season, and when they are full grown I expect to get £750 a year for their feathers alone, without counting increase. Wild birds are now very scarce within the colony, and are only to be found in numbers far in the interior where they are also rapidly decreasing; this accounts for the price of feathers. Of course, the demand is increasing throughout the world, so that it will be many years before the domesticated birds make any marked difference in the market. No stock gives so little trouble; they thrive where a donkey would find it hard to live."

AGRICULTURE IN EUROPE.

THE PROGRESS OF THE PLOUGH

BY CUTHBERT W. JOHNSON, F.R.S.

The history of any agricultural operation is notoriously interesting, but is attended with useful results. Take, for instance, the subject of this paper. When we examine the earliest notices of this implement, then made entirely of wood, and thus causing a very considerable waste of animal power, trace it forward until the days of the great modern implement makers and still onward till the time when the locomotive is banishing animal power, are we not by such a retrospect well encouraged to expect still greater improvements in those modern locomotives? So that as steam is fast banishing the plough-horse, we may not despair of seeing his place occupied by the steam-engine for even the dung cart and the harvest waggon.

There is abundant evidence that the plough was employed by mankind at a very early period. It is true the first notices which

have escaped to us are very slight—such as that in Palestine they ploughed with two oxen, and that their ploughs were constructed with a coulter and ploughshare. It is certain they needed the plough for their winter's fallow. Judging however by what we now witness in Syria and other Eastern countries, their ploughing was probably very shallow, and the plough animals poor, since it is certain that the ass, or even the goat, are still employed for this purpose on some of the light sandy soils of the East.

Then again, the plough employed by the early cultivators was very rude: that of the Roman republic, in its shape, more resembled an anchor than a modern implement; and the same remark still applies to even the plough of India. In these cases the ground thus tilled could hardly have been more than scratched over. The Greek ploughs were of a better construction: they had wheels, a beam, a coulter, and two handles, somewhat resembling a modern wheel-plough; but these, from the shape of the stirer, rather broke the soil than turned it over.

It is uncertain the shape of the early British ploughs. We are not aware whether they had wheels. We, however, learn from an ancient Saxon calendar, that our Saxon forefathers certainly made the implement with wheels; and from a rude sketch in another Saxon MS. we learn that they constructed some of their ploughs of a very rude shape, and even seem to have fastened their draught animals to this plough by their tails, a barbarous custom, which certainly was formerly practised in Ireland to such an extent that the legislature interfered in 1634, and declared, by the 11 and 12 Car. II., c. 15. entitled "An Act against plowing by the Tayle, and pulling the Wool off living Sheep," that "in many places of this kingdome there hath been a long time used a barbarous custome of ploughing, harrowing, drawing, and working with horses, mares, geldings, garrans, and colts by the taile, whereby (besides the cruelty used to the beasts) the breed of horses is much impaired in this kingdome. And also divers have and yet do use the like barbarous custome of pulling off the wool yearly from living sheep, instead of clipping or shearing of them." These wretched practices were then declared illegal, and to be punishable with fine and imprisonment. We may fairly conclude, however, from the few imperfect notices which have escaped to us that the cultivation of the early Britons was far better than is commonly supposed; and we must not forget that our brave forefathers (who so gallantly met Cæsar even in the water, before he landed) are described by no friendly hand. Thus, when Cæsar arrived in England, about 55 B.C., he described the Cantii, or inhabitants of Kent, and the Belgæ, inhabiting the modern countries of Somerset, Wilts, and Hants, as much more advanced than the rest of the people in the habits of civilized life. They cultivated the soil; employed marl as manure; stored their corn unthrashed, and freed it from the chaff and bran only as their daily demands required. The interior inhabitants lived chiefly upon milk and flesh, being fed and clothed by the produce of their herds. "The country," adds Cæsar, "is well-peopled, and abounds in buildings resembling those of the Gauls, and they have a great abundance of cattle. They are not allowed to eat either the hen, the goose, or the hare; yet they take pleasure in breeding them." Cicero, in one of his letters, says:—"There is not a scruple of money in the island, nor any hopes of booty, but in slaves"—a description that the industry and intelligence of succeeding ages has rendered singularly inapplicable.

When we find that the workmanship of the plough of our remote forefathers was rude and imperfect, this is not a matter of suprise: for among the early inhabitants of this country there were no artificers. The ploughman was also the ploughwright. It was a law of the early Britons that no one should guide a plough until he could make one, and that the driver should make the traces by which it was drawn of withs or twisted willow, a circumstance which affords an interpretation to many corrupt terms at present used by farming-men to distinguish the parts of the cart-harness. Thus the *womb withy* has degenerated into *wombige* or *wamble*; *withen traces* into *whipping* or *whipple trees*; besides which we have the *tail withes* and some others still uncorrupted (*Leges Wallicæ*, 283—288). We read also that Easterwin, Abbot of Wearmouth, not only guided the plough and winnowed the corn grown on the abbey-lands, but also with his hammer forged the instruments of husbandry upon the anvil.

Then, with regard to the animals our ancestors employed in the plough, Lappenberg states in his "England under the Saxon Kings," translated by Thorpe, that "many horses were bred, *every man being obliged to have two to his plough*; hence, it is not surprising that the pirates of the north were so soon able to transform themselves into cavalry after their landing on the coasts"; but as Mr. W. Skeat remarks, there are two instances in the Harleian manuscripts of a pair of oxen yoked to a plough. In the Bayeux Tapestry (A.D. about 1080) there is depicted a nondescript animal attached to a two-wheeled plough. It is clearly not a horse; but from its long ears it may perhaps have been intended for a mule, or it may after all have been a rude delineation of an ox, for the man walking by its side holds a goad. King Alfred, indeed, in his version of Orosius (who flourished in the fifth century) says, "Othare himself was among the first men of the land, though he had not more than twenty red cattle, twenty sheep, and twenty swine, and what little he ploughed he ploughed with horses."

The poet Chaucer seems to prove that the husbandman of the fourteenth century, though he might be possessed of a single horse to use for riding, trusted to "cattle" for the purposes of husbandry. In the prologue to the Canterbury Tales we read of the ploughman:

> His tithes paied he full faire and well,
> Both of his proper swinke and his cattell.
> In a tabard he rode upon a mare.

That horses, as well as oxen, were used in the plough in the Tudor days we learn from the earliest English agricultural writer. Although Fitzherbert, in his "Boke of Husbandrye" speaks in a manner that shows that even in his day plough horses were not generally employed, he observes, "a husbande may not be without horses and mares, and specially if he goe with a horse plough." And a few years afterwards Bishop Latimer, in a sermon preached before the king, thus earnestly spoke in favour of the little farmers of his time, and alluded to their plough horses: "Let them," said the martyr bishop, "have sufficient to maintain them, and to find them in necessaries. A plough land must have sheep to dung their ground for bearing corn; they must have swine for their food to make their bacon of; their bacon is their venison, it is their necessary food to feed on, which they may not lack; they must have other cattle, as horses to draw their plough, and for carriage of things to the markets, and kine for their milk and cheese, which they must live upon, and pay their rents."

When Heresbach wrote (A.D. 1570), it was not uncommon in some of the warmer parts of Germany and Italy to plough during the night, "that the moisture and fattness of the ground may remain shadowed under the clodde, and that the cattell through overmuch heate of the sunne be not diseased or hurt." Worlidge, in his "Mystery of Husbandry," describes very clearly the first rude attempt to construct a subsoil plough: he tells (p. 250) "of an ingenious young man of Kent, who had two ploughs fastened together very firmly by the which he ploughed two furrows at once, one under another, and so stirred up the land twelve or fourteen inches deep. It only looseneth and lighteneth the land to that depth, but doth not bury the upper crust of the ground so deep as is usually done by digging."

Jethro Tull, more than a century since (A.D. 1735), paid considerable attention to the plough: he had even searched into the early history of this implement, and concluded that it was "found out by accident, and that the first tillers (or plowers) of the ground were hogs." The plough which he describes, and of which he gives drawings, were evidently (although still rudely and heavily constructed) superior in several respects to all that had preceded them. In fact, as is well-remarked by my friend Mr. J. Allan Ransome, in his valuable work on the implements of agriculture, for ages the plough was little more than a rude, clumsy instrument, which served only to rake the surface, instead of making furrows in the land sufficiently deep for the seeds to be buried. It was not brought to anything like a perfect tool for the purposes required till the close of the seventeenth century.

The Dutch were amongst the first who brought the plough a little into shape, and by some means or other the improved Dutch plough found its way into the northern part of England and Scotland. Those who have traced the history of the plough agree that one made by Joseph Foljambe, at Rotherham, and for which plough a patent was obtained in the year 1730, was the most perfect implement then in use; and to this day it is well-known by the name of the Rotherham plough. This plough was constructed chiefly of wood; the draught irons, share, and coulter, with the additional plating of iron to the mould-board and sole, being the only parts made of iron.

Mention must also now be made of a step in the march of improvements by the ingenious and justly celebrated James Small, a Scotchman. He constructed a plough on true mechanical principles, and was the first inventor of the cast-iron turn-furrow, commonly called the mould-board; and, although more than a century has since passed, Small's plough may in most respects be referred to as a standard for the elements of plough-making. James Small established his manufactory of ploughs and other agricultural implements at Black Adder Mount, in Berwickshire, in the year 1763, and died about thirty years afterwards, having devoted the best part of his life to the furtherance of pursuits connected with agriculture.

It is difficult to follow the very gradual improvements which took place in the manufacture of the plough from the death of Small until the time when, in 1785, the late Robert Ransome of Ipswich began to employ cast-iron instead of wrought in its construction. Still more difficult is it to award the due meed of praise to the producers of such modern ploughs as those of the Ransomes, the Howards, and a host of other great makers. Of the steam plough, whose introduction has been so recent, and its progress so rapid, it is almost needless to speak. But there is a growing expectation that the time will come when the steam locomotive will travel with the load it propels. By this means it will be able to

accomplishing nearly all the work of the farm. This would seem to be [illegible] of the terms of the prizes offered by the Royal Agricultural [illegible] at the Wolverhampton meeting, and it is evidently the opinion of Messrs. Brazwell and Amos. In the excellent report of these engineers of the trials of the traction engines exhibited at that great meeting they observe: "There appears no valid reason why locomotive engines should not be made suitable for moving agricultural machinery, whether thrashing ploughing by means of windlasses, or for other purposes for which the farmer requires motive power; and it was with the view of encouraging the manufacture of such engines that the Society determined this year to offer a prize, not for a mere locomotive, but for 'the best agricultural locomotive engine applicable to the ordinary requirements of farming.' It may be as well to say a few words upon the history of common road-locomotion. It is now nearly forty years since Gurney (and there were probably others before him) exhibited his common-road steamer as a competitor with the stage coach of the period. He was speedily followed by Ogle and Summers, by Maceroni, by Russel (whose engine however threw great discredit on the cause in consequence of its exploding), by Sir Charles Dance, and by Walter Hancock. It was this latter gentleman who from about 1825 to 1835, did more than any of his predecessors or competitors to show the feasibility of using steam-power as a means of propulsion on common roads at higher speeds than those attainable by the best stage coaches. For many months together his steam-carriages, competent to carry from 15 to 20 passengers, travelled regularly from the Bank to Paddington and back at the ordinary sixpenny fares then charged by the omnibuses, and besides the Paddington journey he very commonly used to come out from and return to his factory at Stratford, his carriages passing through Whitechapel, Leadenhall-street, Cornhill, and the busiest parts of the City of London. In his steam-coaches he exhibited a very large amount of ingenuity and of engineering knowledge. The boilers and engines he manufactured would compare favourably with the best productions of the present day—a great thing to say of a man who worked 35 or 50 years ago, when high-pressure light engines were so much less understood than they are now."

From such a retrospective glance at the improvements which have so slowly, yet so steadily taken place in the plough, we may well be encouraged to hope for still greater advances. When we note how rude was the original implement, how iron was slowly introduced in the construction, how it was first worked by the ox, and afterwards by the horse, and that now the steam engine is fast superseding both, we may well feel assured, that by further improvements in the locomotive, much deeper and better ploughing will hereafter be accomplished than any we have yet witnessed.—*Agricultural Journal.*

AGRICULTURAL STOCK.

CATTLE AND SHEEP FOR THE MOUNTAIN REGIONS OF CEYLON.

Ceylon Observer.

DEAR SIR,—With reference to the paragraph on the above subject in your issue of the 22nd instant, I send you the following extract from a description of the Indian Bison, *Bos Gaurus*, by Walter Elliott, Esq., (now Sir) late of the Madras Civil Service, from the *Prodromus Faunæ Zeylanicæ*, Appendix.

For the following particulars derived from the observation of the animal in the Shervaroyah hills, I am indebted to Mr. Fischer, of Salem. "The Bison ordinarily frequents the hills, seeking the highest and coolest parts, but during the hottest weather, and when the hills are parched by the heat, or the grass consumed by fire, the single families, in which they commonly range the hills, congregate into large herds, and strike deep into the great woods and valleys; but after the first showers, and when verdure begins to re-appear, they again disperse and range about freely. In wet and windy weather, they again resort to the valleys, to escape its inclemency and also to avoid a species of fly or gnat which harasses them greatly. In the months of July and August, they regularly descend to the plains, for the purpose of licking the earth impregnated with natron* or soda, which seems as essential to their well-doing as common salt is to the domestic animal when kept in hilly tracts."

Paragraphs like the above may afford useful hints for the rearing of domestic cattle in such places as the Horton Plains. May not Newera Elliya and other parts of Ceylon be deficient of natron or the salt which seems essential to their well-doing, and could not those salts be supplied at a rate which would pay for the rearing of cattle? Bearing on this subject I send you the following extracts from the history of Ceylon by that shrewd observer, old Robert Knox, whose work was published first in 1681. In case these extracts have been referred to in the report of the Cattle Commission, I may state that I noted them in connection with this subject long before the Commission was thought of.—Knox's Ceylon, appended to the History of Ceylon by Philalethes, p. 10.

THE PROVINCE OF OUVAH.

This city in the kingdom or province of Ouvah, which is a country well watered, the land not smooth, neither the hills very high; wood very scarce, but what they plant about their houses; but great plenty of cattle; their land void of wood, being the more apt for grazing. If these cattle be carried to any other part in this Island they will commonly die, the reason whereof no man can tell; only they conjecture it is occasioned by a kind of small tree or shrub, that grows in all countries but in Ouvah, the touch or scent of which may be poison to the Ouvah cattle, though it is not so to others. The tree hath a pretty physical smell like an apothecary's shop, but no sort of cattle will eat it. In this country grows the best tobacco that is on this land. Rice is more plenty here than most other things.

THE CAPITA GAUHA, p. 33.

THE capita gauha is a shrub never bigger than a man's arm. The wood, rind, and leaves, have all a physical smell, and they do sometimes make use of it for physic. The leaf is of a bright green, roundish rough, and as big as the palm of a hand. No sort of cattle will eat it; no, not the goats, that will sometimes browze upon rank poison. There is abundance of these trees everywhere, and they grow in all countries but in Ouvah; and this is supposed to be the cause that the Ouvah cattle die when they are brought thence to any other country. They attribute it to the smell of this tree, of such a venomous nature it is to beasts; and therefore to destroy their fleas, or to keep their houses clear of them, they sweep them with brooms made of this shrub. It is excellent wood for firing, and will burn when it is green. There are no other coals the goldsmiths use, but what are made of this wood.

The plant referred to is no doubt the very common Kappitiya or Gas-Kappitiya of the Singhalese, and the *Croton Laciferum, L.*

In addition to what Knox mentions respecting the uses of this plant, its charcoal is also used for fireworks, and in reference to Knox's statement that in Ouvah the Kappitiya does not grow, but that in it "grows the best tobacco that is on this Island," I know that for tobacco and other cultivated plants, no manure is better, or more commonly used by the Singhalese, than the leaves and young twigs of the Kappitiya plant. Pass through any portion of the Western Province, and observe every bit of land newly prepared or planted near dwellings; and you will see the ground covered by layers of leaves and young twigs of this plant, and for young plants of chillies, tobacco, brinjalls, betel vine, sweet potatoes, and in fact every other plant useful to the natives, a shade is placed over them of Kappitiya-leaves and branches.

Mr. Thurstan, when in charge of the Industrial School, told me that he confirmed the experience of the natives by praying that there was no manure for tobacco equal to the leaves of the Kappitiya plant.

I believe that in addition to the rotten leaves being a good manure, there is a principle in the leaf which is a bane to insects, which would destroy the plants in the absence of these leaves. That branches of the Kappitiya, spread on the floors of houses not occupied, and that brooms made of it are about the best thing to rid houses of fleas, there can be no doubt. But this is a botanical digression from the rearing in the hills of Ceylon of the *Bos taurus.*

I botanised from Newera Elliya to Badulla in 1859, and I do not recollect that I noted the absence of the Kappitiya plant from Ouvah. Will any of your correspondents help to throw light on the truth or otherwise of Knox's statements. If the cattle in Ouvah are exempt from disease affecting other districts, what are the reasons for this exemption, &c., &c.?

The character of the open grassy plains in the hills, called patnas, varies exceedingly in respect to the species of grasses which generally compose them. Those covered with the tall aromatic lemon grass, Andropogon Nardus, L. have some small good fodder grasses between the tufts of lemon grass, and this latter grass is eaten by cattle when it springs after the old grass is burnt, but the milk and flesh of cattle feeding on it are said to have an aromatic taste. The cold wet grassy swamps near Newera Elliya are in many cases composed largely of *Cyperaceæ*, plants like grasses, but having triangular stems, and not generally eaten by cattle if real grass can be had.

When on a visit near the Lindula Patnas in Dimboola, about 18 months ago, I was much struck with the apparent richness of the grasses on these patnas, and their identity with the grasses converted into hay in the Bombay Presidency, viz. species of *Anthistiria*, and which is largely brought over to Ceylon with batches of horses from Bombay. In writing of the two species growing at Bombay, viz. *Anthistiria Cymbaria Roxb:* and *A. ciliata Linn*, both natives of Ceylon (in addition to other three species) the authors of the Bombay Flora remark on *A. ciliata*. "This and the preceding are generally found together in the same field; they form the greater part of the best specimens of hay in the country.

* Called Sawesalana by the Singhalese

This latter differs scarcely, if at all, from the famous Kangaroo grass of New Holland (A. Australis). It grows also in South Africa." Has any attempt at making hay of these grasses in Ceylon been made, and with what results? I fear that no botanical description of these grasses would help those of your planting friends who are interested in rearing cattle, but I may mention that they are almost the same height, and are a good deal like the common oats when growing, with the glumes longer, and the flowers in denser masses, generally drooping. The Singhalese name of the most common species, is Pini-Baru-tana.

In a conversation I had with Mr. Moore, the Director of the Botanical Gardens at Sydney, on the subject of the fodder grasses in Australia and Ceylon, when Mr. Moore passed through Ceylon some years ago, he told me that one of their best fodder plants near Sydney, was the *Stenotaphrum Americanum Schr.*; but I find that Col. Sir William Monro, C. B., &c., one of the best authorities on the grasses, considers this grass as identical with the *S. complanatum Schr.* of India and of Ceylon. This is a common grass growing on rich moist banks near Colombo and elsewhere in Ceylon, but I do not think it could be grown with advantage on the Horton Plains.

The most valued of our natural grasses, the *Aragan Pillee* of the Tamils and growing nearly all over Ceylon, has been grown successfully in India as a cultivated grass, but I know of no grasses, cultivated in Ceylon, that have yet succeeded as valuable for fodder except the Guinea and Mauritius grasses.

Trusting that my notes on such an interesting subject as the rearing of cattle on the hills of Ceylon have not extended to too great a length for the columns of your paper Yours truly,

W. F.

CULTIVATION OF THE POPPY IN CHINA.

THE following letter from Mr. Colborne Baber, dated British Consulate, Kew Keang, the 22nd November 1871, has been received by the Secretary to the Government of India, Financial Department:—

It is not in my power to add much to the information which has been previously furnished you with regard to the cultivation of the poppy in China and other particulars.

Referring to query No. 3, it appears certain that this cultivation is extending considerably. The undetailed nature of the information obtainable by foreigners renders it difficult to compare this year's crop with the last; but every intelligent native of this place who is questioned on the subject affirms without hesitation that the last two years have seen a notable increase in the production of native opium.

As regards this particular province of Kianghsi, it has been stated in previous reports that the poppy is cultivated to some extent in the southern districts. If such cultivation is still carried on, which appears extremely doubtful, it is so insignificant in extent as to be inappreciable. It is safe to say, practically speaking, that no opium is produced in this province.

In reply to query No. 4, I beg to enclose translation of a memorial to the Throne by a Censor upon the subject of poppy growth and taxation in the province of Ssu-chuan, together with an imperial reply issued on the 5th October, both of which were published in the *North China Herald* of the 15th November. It is scarcely worth remarking that the subordinate officials of Ssu-chuan are extremely unlikely to carry the imperial prohibition into effect, now that they have discovered a system of increasing their revenue by an impost on the prescribed cultivation.

(*Query 5*).—The extension of poppy cultivation of course indicates a corresponding increase in the consumption of native opium. The native growth however, can never seriously affect the consumption of the Indian import. Once accustomed to the superior flavour and potency of the latter, no opium smoker would dream of preferring the native variety, which in fact is only employed for purposes of adulteration, or consumed by the poorer classes and relinquished even by them the moment they can afford the larger price of the Indian drug.

It is often supposed that the inferiority in strength of the native opium may be accounted for by the ignorance and incompetence of the cultivators, who do not possess the experience of their Indian competitors. But both Chinese and Foreigners who are acquainted with the subject write in attributing this to the peculiar nature of the Chinese soil, the products of which are almost invariably deficient in strength and quality; witness the insipid fruits, the tasteless vegetables, the weak and flavourless tobacco, and a hundred other instances. Even the most carefully cultivated product of China, its tea, is undoubtedly inferior in strength, and many consider, in quality to the tea of Assam.

It appears then that the Chinese drug must always be inferior to the Indian; so long as this is the case, the opium-smoker will continue to give the preference to the latter, in spite of the large difference in price, and the conclusion is certain that the consumption of Indian opium can never be seriously affected by the competition of the indigenous variety.

The native opium consumed in this vicinity is brought from Ssu-chuan. That produced in Yunnan, Kweichow, and other localites scarcely ever finds its way to this neighbourhood, as the expense of transport renders it dearer on arrival than even Indian opium.

OPIUM CULTIVATION IN CHINA.

THE Supplement to the last number of the *Gazette of India* contains an interesting communication from Mr. Baber, the Acting Vice-Consul of Kew Keang, on the subject of the cultivation of opium in China. There can be no doubt, in the opinion of the writer, that this cultivation is extending considerably, and during the last two years in particular, there has been a notable increase in the production. At the same time Mr. Baber is of opinion that the native growth can never seriously affect the consumption of the Indian drug. "Once accustomed to the superior flavour and potency of the latter," he says, "no opium-smoker would dream of preferring the native variety which in fact is only employed for purposes of adulteration, or consumed by the poorer classes, and relinquished even by them the moment they can afford the larger price of the Indian drug."

The difference in quality which is the cause of this preference he believes to be irremovable, and upon this point probably the future of Indian opium depends. But we must confess the arguments do not satisfy us. All who are acquainted with the subject both Chinese and Foreigners, agree, we are told, in attributing the inferiority of the native opium to the peculiar nature of the Chinese soil, the other products of which are also generally deficient in strength and quality. We however find a difficulty in believing that the soil of so immense a tract of country as that on which China opium is grown, can be distinguished by any such general peculiarity as would entail this result.—*Englishman.*

CHINESE OPIUM.

To the Editor of the Englishman.

SIR,—In your paper I see some remarks about opium, and that it has been asserted that the Chinese cannot grow it equal to the Indian drug. There cannot be a greater mistake, and I am glad to see you think so too. The soil in Western China is quite equal to any we have, and very little training or experience will enable such an industrious and shrewd people as the Chinese are to cope with us only too successfully. The sooner we admit the revenue on opium is doomed, the better. I believe the drug is cultivated only too successfully round the borders of Assam. Where I used to sell 20 seers per month, I now sell less than 5. I may add that I have procured the illicit drug in the villages, though only as samples, and to satisfy myself *it was to be got.* S. E. P.

MYSORE AGRI-HORTICULTURAL SOCIETY.

The Cockchafer-melolontha vulgaris.

EVERYONE knows the cockchafer beetle, but it is not so generally known that this insect in its larva or grub stage is one of the greatest pests of our Indian gardens. The large bluish white fat grub with big brown head and large mandibles, found so often gnawing away at the roots of geraniums, verbenas, and all juicy soft-wooded plants, destroying them just below the surface, is the larva of the cockchafer.

The cockchafer beetle deposits a number of large dirty white eggs a few inches below the surface of the ground, selecting a loose rich vegetable earth or dung heap—these eggs produce larvæ or grubs which take 3 years to mature into beetles. In the dry, cold, and hot seasons—these grubs work themselves down deep under-ground and remain in a state of torpidity until the rains set in, when they come to the surface and resume their ravages. In the third year the large grub works itself a hole well under-ground which becomes compacted into a kind of case or cell, and therein it forms a chrysalis, emerging in time as the perfect cockchafer, in which state happily it does not do much more harm in India—but on the continent of Europe cockchafers commit ravages at times like swarms of locusts—they appear in this devastating form generally every fifth year, which are in consequence termed flying years. In the flying year of 1868, in Saxony, 27,700 cwts. of cockchafers were destroyed, mixed with lime and used as manure. Numerous attempts at remedies have been tried in France to destroy the larva they are baited—in June, gardeners in places particularly infested by cockchafers and where a large brood may be expected, sow rows of salad, which it is well-known the grubs are fond of, and they are enticed. In August these places are hoed in a hot sun, thus turning up the young grubs gathered round the salad, and if left exposed, the sun soon kills them. This simple work is repeated several times on a very hot day, and it is asserted that it effectually destroys them. Starlings are found to destroy cockchafer beetles in enormous quantities, they have therefore been encouraged in infested districts. Artificial breeding cages being made to induce the starlings to occupy them, and with the influx of starlings the cockchafers have disappeared.

So destructive are these grubs in our gardens at Bangalore that [illegible] in the ground during the [illegible] November—they eat off the roots of [illegible] after May and leave few soft-wooded [illegible]. They do not attack balsams, nasturtiums, portulacas, or fleshy-rooted plants, and seem particularly attracted by rich manures. The only remedy known as yet is to grow those plants in pots which are liable to be attacked by them.

In November they work down deep into the soil and remain torpid till June, and during that time the garden beds are free from them.—*Bangalore Spectator.*

HORTICULTURE IN BENGAL.

It has long been matter of surprise to us that some of our native gentry, possessing ample spare time and plenty of money, should not have taken more kindly to the fascinating amusement of amateur gardening, since to our mind there can be no greater pleasure or more gratifying triumph than to accomplish, so to speak, some feat in floriculture which no one has before achieved. Furthermore, gardening, (in which general term we mean to include floriculture, arboriculture, the improvement of indigenous fruits and vegetables, and the introduction and acclimatization of exotic ones) is, perhaps, *the* branch of science in which most remains to be done in India, while, at the same time, it is the one in which most might be done, if only enthusiastically taken up and persevered in by persons in the enjoyment of the necessary leisure and sinews of war. For instance, when we consider the encouraging results of the endeavours of some members of the Calcutta Horticultural Society to grow hyacinths, cyclamens, and other bulbs or roots, the cultivation of which in Bengal the erudite Forminger off-handedly pooh-poohs as utterly hopeless, when an English tulip and crocus have been coaxed into flowering in a Calcutta February, who can doubt that very much more might be effected by a scientific application of proper contrivances. Indeed, according to our own experience, plants and flowers seem always, in a manner, to meet half-way folks who take an interest in them, and there is perhaps more truth than we are aware of, in the simple words of the Shaker Elder, which we quote from Hepworth Dixon's New America, namely, "I don't know if a tree ever comes to know you; I think it may; but I am sure it feels when you care for it and tend it; as a child does; as a woman does."

The writer has often thought, though unfortunately he is not blessed with the pecuniary wherewithal to test his theory in practice, that if a conservatory were to be built close to a lofty wall facing the north, with a treble or even double roof and sides of glass, having wide air-chambers interposed, and with the outer roof and sides tinted or varnished, and if such a structure were to be artificially cooled by some mechanical process, a low temperature might be preserved, in which the lovely pelargoniums, calceolarias, fuchsias, and other favourite home flowers we miss so much here, could, at any rate, be kept alive through the hot weather and rains, to gladden our eyes during the cold season with their gay profusion of exquisite colours. During the portion of the year when the sun is vertical, the building might be protected from his direct rays by a screen stretched above it. Such an experiment, it is true, would cost a good deal of money, and might end in a failure. But when we remember how many thousands of rupees are annually frittered away by wealthy natives in nautches and other more ignoble pleasures, we cannot stifle a regret that some of those thousands are not more usefully employed in the advancement of horticulture, or in other strivings for the permanent public good. Our aristocracy in England have their extensive ranges of hot houses and conservatories, such as at Chatsworth and Stow House, where there poorer fellow-countrymen are allowed to feast their eyes on some of the most beautiful creations of Him who made the first man a simple gardener. Why, in the same way, should not our rich native gentry possess their ranges of "cool houses." As regards the artificial cooling of the glass house we imagine that it could be managed by means of an adaptation of Shirk's refrigerating apparatus worked by a small steam-engine, so as to transmit currents of really cold water through piping in the same way as we had seen large buildings in England warmed with hot water throughout. For this idea we are indebted to a writer in Chamber's Encyclopædia, and in conclusion we say—*Fiat experimentum.*—*Evening Mail.*

THE PONDICHERRY FILATURES.

People who have devoted attention to the subject, and whose opinions have weight, state that up to the fourteenth century, the art of converting cotton into thread and cloth was entirely confined to Orientals. M. Turpin, missionary at Pondicherry, gave in 1718 very interesting details respecting the manner in which the people of this country cultivated this staple and worked it into textile fabrics. The several processes described by him as regards the manufacture of thread in the interior of India, it is scarcely necessary to notice, have not since undergone any material improvement. The Government of Pondicherry much to its credit, has by the establishment of several *filatures* in the town of Pondicherry, done good service in introducing in the country processes in the manufacture of cotton modelled on those prevalent in Europe. In 1827 M. Deshesaynes de Richmont, the then Administrator General of the French Establishments in India, conceived the idea of establishing a filature in Pondicherry. Of the particulars respecting its origin and working, a communication was addressed to the French Government in the year 1834, by M. C. Poulain. Our excellent French contemporary the *Courrier de l'Inde Française*, has republished certain extracts from that communication. In 1828 the Government of Pondicherry observing that the commerce of the country was languishing, and that Indian manufactured textiles were in little demand owing to importation from Europe into Indian ports, which prior to 1828 obtained their supply of cotton goods from Pondicherry, proposed to give this trade a fresh impetus, to encourage and introduce into French territory several branches of commercial industry. The Government with a wise liberality offered to defray a portion of the cost of the undertaking. It was of opinion that private enterprize would be shy in embarking in an undertaking attended with some risk, and it therefore sent out an order to France for the machinery and a few European weavers. Before however this order was executed, Messrs. Blin del Bruck and Company came forward, offering to establish a *filature* on their own account, and having been encouraged by the French Government, they transmitted at once orders to France for the machinery necessary for a filature capable of turning out one hundred pounds of cotton per day. The Government advanced to these enterprizing gentlemen such funds as they needed, and shortly after the first filature was started and worked with success at Pondicherry. There are now three large institutions of the kind in that town.—*Madras Standard.*

BRAHMA POOTRA FOWLS.

Years of experience in keeping Brahmas confirm us in the opinion of them which we formed at the end of the first year after we imported them. They are decidedly the best fowls of any we have had (and we have kept most kinds) for all useful purposes, and the most fitted to thrive and prosper in our variable climate. Our climate, from often being cold, damp, and variable, is not very good for domestic fowls, but the Brahmas, from their contented dispositions and hardy constitutions, defy the inclemencies of our worst seasons, and always live and do well. They enjoy a wide range, and profit by it, but they bear confined quarters as well as any kind—better than any except the Cochins. We never knew any fowls so hardy as they are; but this good quality, we fancy, is interfered with in strains which show a cross with the Dorking. The Brahma we admire is a stout, plump, compactly-made bird, large without coarseness, and brisk in habit, without the mercurial spirit which renders some active fowls very difficult to keep inside their own fences. The colour is a mixture, in various proportions, of white, black, and grey; in the light Brahmas the white predominates; in the dark it is less general, and sometimes almost absent. The white is very clear, and any mixture of brown or other *colour* in the plumage is a fault. The pea-comb, to our mind a necessary characteristic, is peculiar—a small, delicate, triple-comb. The legs are stout, yellow, and feathered. We know no fowl that breeds more true to kind in all points. We have kept them now for nine or ten years, and in all that time have found no sensible variation in any of their points. They are very good for the table, and excellent layers.

No matter interesting to the poultry amateur has occasioned more discussion than the origin of these fowls. We British fanciers imported them from America. They were made known in England about the year 1852, and very few years before that they were evidently unknown in the United States, since Dr. Bennet, who was afterwards the chief exporter of them to England, wrote a work on domestic fowls, in which they are unnoticed. The account given by a Mr. Miner, the editor of the *Northern Farmer*, of the introduction of Brahma Pootras into the United States is as follows:—"imported by Mr. Baily, of Mount-street, very shortly after Brahmas first became known in England. They were afterwards sold for 100*l.*, and became well known at exhibitions. They have now been dead some years. The hens were too heavy in colour for our fancy, but the cock was a very fine old bird. We remember him quite well when we made his *debut* at the Birmingham Show, we having just seen, gloried in, and left at home our own first importation of Brahmas—also a trio.

There is one peculiarity in Brahmas worthy of notice—and that is, the way in which they struggle with disease and overcome it. To try to cure sick fowls is, in most instances, a very hopeless task, but not so with them. We have had them persistently refuse food, when eating would have been injurious, for many days, and so get through sickness under which most fowls would have sunk. We have had Brahmas do well after the operation of crop opening, mainly from their habit of abstaining from eating wheniill. The little chickens seldom die, or suffer from chicken ailments.

The gradual progression with which Brahmas made their way into favour was slow and sure. At the time they first came among us, amateurs had got rather tired of the speculative impetuosity with which the Cochin mania had been pursued, and so the new comers were less cun after than the former favourites have been. The Cochins were, however, so generally and so deservedly liked, that any fowls possessing similar tame familiar habits were sure to be well received; and the superiority of the Brahma over them in one point, in which they are deficient, *i. e.*—fullness on the breast—as a table fowl, was readily appreciated. One of our earliest breeders of Brahmas wrote several years back:—"There is in them a breast amply developed and possessing a rotundity approaching, when in the hand, to what game fowl breeders and amateurs call cleverness, which is that a well-proportioned fowl, placed breast downwards on the palm of the hand, should balance, which it cannot do where the breast is wanting. In December 1845, the Birmingham Committee gave these fowls a class to themselves—a distinction which their peculiarity and merit quite deserved.—*Ladies' Newspaper.*

COCOANUT OIL AND COIR YARN.

(*Cochin Argus.*)

SINCE the last eight years the price of cocoanut oil has never been so low in the local market as it has been during the past week, a circumstance which deserves more than a passing notice. Readers of our commercial intelligence will have observed that this decline in prices has been long anticipated, and we do not believe that this fall will be arrested, looking at the present position of the oil market. The price during the week has been Rs. 68 @ 69 per candy, and at these rates we daresay a large business will be done. The yield of nuts this year has been exceedingly abundant, and as Calcutta, Bombay, and the Coast ports cannot consume the enormous quantities of copprah and oil which are being daily thrown on the market, prices have materially given way. The quantity of oil daily arriving in the market is immense; we think we are rather below the mark when we estimate it at 150 candies. The supply being greater than the demand, dealers are compelled to accept low rates, and if supplies continue on the present scale, there can be no doubt that prices will go lower before long. The market this season opened at Rs. 80 per candy, and during the four or five months of dry weather large quantities of copprah have been prepared. No complaints as regards short crops is to be heard from the natives this year. There has been no drought for several years, in fact, the rainfalls have been heavy, and the trees are in as healthy and luxuriant a condition as could be wished. Another circumstance which accounts for the large supplies of oil and coir goods this season, is that during the last fifteen years or so, the natives have been bestowing a vast amount of attention to cocoanut cultivation, and some idea of the rate at which this is carried on may be realized from the fact that paddy land is converted into cocoanut plantations, and large portions of the backwater are reclaimed, and at once planted with cocoanut trees. This has developed the import rice trade of this port, as the taking up of immense tracts of paddy land throughout every part of the country for the purpose of cocoanut cultivation has rendered the importation of rice for the consumption of the population necessary. There was a time when we used to export rice, but things are now changed, and in course of time we may be sure that the rice trade will expand, in proportion to the increased attention paid to the cultivation of cocoanut trees. For this reason a famine in the rice districts from whence we derive our supplies will be a very serious matter for Cochin and Travancore, for although there is likely to be an abundance of cocoanuts, we shall feel acutely the want of the staff of life.

A glance at the statistics which we subjoin will show that we have got through a large amount of business in cocoanut oil alone since the opening of the season in August last. The items we give, include the clearances in March to date.

	1871	1870	1869	1868
	72.	71.	70.	69.
To London	84,134	270	30,115	64,000
" Continental Europe	445	311	...	...
" Bombay	58,611	24,878	40,594	35,501
" Other places	22,284	27,415	13,460	14,566
cwts.	165,374	52,874	84,169	118,067

It is clear that the exports of 1871-72 will exceed those of any other season. Indeed, what has gone forward to date is not only in excess of the exports of last season to London alone, but to Bombay, Continental Europe, and other countries during the same period last year, as is proved by the above figures. The total exports to all places last year amounted to cwts. 114,452, but we believe that this season's exports to London alone, will be considerably in excess of this quantity. There are now about 3,[illegible]0 tons of oil afloat for London.

The exports of coir yarn to London are also [illegible] heavy, as will be seen from the following comparative [illegible]—

	1871.	1870.	1869.	1868.
	72.	71.	70.	[illegible]
To London	74,874	30,307	[illegible]	[illegible]
" Colombo	1,075	2,423	[illegible]	[illegible]
" Bombay	31,972	25,260	[illegible]	[illegible]
" Other places	21,314	25,420	[illegible]	[illegible]
cwts.	129,135	93,659	[illegible]	[illegible]

The demand for this article has been well-sustained since the opening of the season, but the tenor of recent advices being rather unfavourable as regards fine yarn, there is rather less enquiry for yarn of this description just now. Very little fine superior yarn finds its way into this market now, as all that is manufactured goes to Alleppey, where it fetches the most exorbitant rates. Yarn which could ordinarily be purchased here at 80 @ 90 Rs. readily fetches Rs. 120 @ 130 at Alleppey; in fact, such is the competition amongst the two coir-matting manufacturing firms there that the dealers are "interviewed" in their houses in the interior, and any fine yarn that they may have ready is at once taken at prices which if for shipment to the English market are ruinous, as yarn bought at much lower rates, and shipped to England has resulted unsatisfactorily.

A noteworthy feature in the coir trade is the great demand which has sprung up of late for coarse yarn. The chief purchasers are natives, and they find every inducement to speculate in it, as almost all their shipments have given them handsome returns. The yarn which seems to be in particular request is of that thick coarse description which used at one time to be shipped to England in the shape of coir junk. Immediately after the close of the Franco-German War, the price of coarse yarn went up, and a few parcels of this description which had arrived about that time sold remarkably well, and since then large quantities have gone forward. The appearance of this kind of yarn—commonly known as "Menpatty" yarn—is so unsightly that one would hardly feel inclined to go in for it, and yet the natives eagerly take all that they can get. The price is about Rs. 26 @ 27 ₱ candy, and shipped in dholls it generally realizes from £25 @ £28 ₱ ton in the English market. We have seen a sample of Menpatty yarn, *dirty, red, and coarse*, (which we are sure no European merchant would allow to be brought into his premises), which realized £28 ₱ ton in England; this stuff was purchased here at Rs. 25 @ 26 ₱ candy, while rope yarn dholls, of good fair color and good make, bought here at Rs. 30 @ 37 did not fetch more, although there was such a disparity in the cost as well as the quality of the two descriptions of yarn. As a matter of course the natives are buying the stuff largely, and dholling, and such is the desire to get their goods afloat that even as broken stowage high rates of freight are paid. It is believed that there is a great demand for coarse yarn on the Continent, and we hear that it is also largely used for making coalsacks so that quality is no object to the buyers. Whether however the high rates which now prevail will continue remains to be seen.

DRYING POTATOES.

The following letter from Lieut. J. F. Pogson concerning a simple and inexpensive mode of drying potatoes, was read at the Meeting of the Agricultural and Horticultural Society at Calcutta, held on the 21st March 1872.

I have the pleasure to inform you that I have discovered a very simple and inexpensive way of drying potatoes. My object in solving this problem, was to secure a large supply of food, at the time other crops were growing, and which should also be available in case of famine. The potatoe, though rich in starch, is poor in gluten, and it was necessary, if possible, to remedy this defect. It is proper that I should here mention that I fully succeeded in drying twelve ordinary potatoes, by the hot sand process, but I condemned it, as being much too slow, and requiring apparatus which the agriculturist could not afford; further no increase of nourishment was secured. By the new process not only is the potatoe very quickly dried, but its nutritive power is much increased by the presence of the drying medium or desiccator. The process is as follows, *viz*:—

1*st*.—Secure some *dall*-meal or flour, using the common *Oord* dall for the purpose.

2*nd*.—Dust a clean cloth with this meal.

3*rd*.—Take any number of dry potatoes, (which have been well-washed before drying), and cut off the rose end (which keep for seed), and the root end, (which use or keep for cattle food.)

4*th*.—Cut the body or best part of the potatoe as obtained, into slices, about ½ to ¾ inch thick, and place these discs (without removing the skin or peel)

[illegible] with their skins, their upper surfaces [illegible] may be shaved, whilst a sharp, thick, or [illegible] removed with sliced potatoes.

[illegible] (in order of preparation), and place them on [illegible] boiling water three or four times, and so exhaust them [illegible] slices in baskets, and let dry in the shade.

[illegible] can be broken like a biscuit, the process is complete, [illegible] is ready for use, or storing. The fracture reveals the [illegible] contained within the film or layer of *dall* meal. It stands to reason that the gluten of the *dall* has enriched the starch of the potatoe, and as not a particle of the original potatoe gluten has been removed, the dry potatoe so obtained, is a superior article as compared with any other description of dried tuber.

According to Professor Johnston's table, one hundred pounds of dried potatoes contain of,—

Water	Nil.
Skin	11·
Starch	79·
Gluten	8·
Fat	1·
Mineral matter	4·

I believe the potatoes were put in a press, and the water thus removed. By my process the best part of each potatoe is preserved for human food, whilst the inferior parts may be similarly treated and kept for cattle food. I trust the publication of this communication will induce others to carry on the preparation on a large scale, and I think when the ryot learns the value of the potatoe, he will not object to cultivate it as a field crop. I have reason to believe that sliced turnips may be dried on this plan with perfect success, and as the superior descriptions of *dall* may be used, a very delicate article of food would be the result, and especially so, if the potatoe skin was removed when the slices had somewhat hardened.

UNITED STATES TOBACCO.

It is stated that the native leaf tobacco exported from the United States during the year ending June 30th 1870, amounted to 21,100,420 lbs. and during the year ending June 30th 1871, to 19,008,793 lbs. The seed leaf grown in the State of New York, it is asserted, is in great demand for manufacture, instead of fine Connecticut, which did not grow in 1870. The demand for Pennsylvania and Ohio tobacco of the crop of 1870, it is stated, has materially improved. The yield of the crop of seed leaf tobacco of 1871, just harvested and cured, it is estimated, will amount to 160,000 cases, distributed as follows:—40,000 cases of Connecticut River tobacco, 40,000 cases of Ohio, 30,000 cases of Pennsylvania, 25,000 cases of Wisconsin, 20,000 cases of New York, and 5,000 cases of Illinois tobacco. This crop it is believed will be the largest ever grown in this country, the average yield being 60,000 cases. The heavy crop of 1862 amounted to 85,000 cases, and reduced prices one-half. The consumption of domestic tobacco is placed at 60,000 cases per annum, and the export of 1872 is estimated at 70,000 cases. The stock of tobacco on hand amounts to about 40,000 cases, and adding this to the 160,000 cases of the crop of 1871, there will be a total of 200,000. Subtracting from these figures the 130,000 cases consumed at home and abroad, there will remain a surplus of 70,000 cases.—*Jubulpore Chronicle.*

GARDENING.

Gardening is a pursuit in which connoisseurs are notoriously intolerant of the criticisms of the ignorant. A goose would have as much chance of a hearing from the fox about to sup off her, as an outsider, who only knows vegetables from their cooked appearances, has from a professed horticulturist. Every gardener is a bigot to his own pretensions, and having read the last issue of the *Chronicle* of the craft, we are not surprised that he should be so. A leading article in that periodical informs its readers that to become a good bishop may take a man ten years, but that to become a gardener is only accomplished in a life-time, and seldom then. "Great writers, such as Cobbett, Scott, and Dickens have given advice to gardeners; but," says the *Chronicle*, "they had much better have attended to their own respective businesses. "Cobbett," it tells us, "rested his reputation on the single tree which still bears his name—'Cobbett's Locust tree;' but after all these years of experience planters fight shy of it." Botany, we are told, "admits of no gloss," and Sir Walter Scott's inaccuracies, though pardonable in romance, have no excuse. "Again we have the late Charles Dickens, the talented author of so many works of fiction, mistaking sugar peas for ordinary garden peas! Had he," writes the *Chronicle* severely, "been born to wealth instead of humble life, he might have known the vegetables used at the table of the higher classes." This remarkable article, after summing up the qualifications necessary to make a good gardener, sums up with a contempt for filthy lucre—"He must fling the love of money overboard." But above all the essential is virtue: without virtue no man can be a good gardener. "We have never," says the *Chronicle*, "known a gardener get a good situation, or hold it long after he had got it, who disregarded virtue; and when his good deeds did not stand him in good stead, he had to feign the good and hide the bad side of his character—thus proving by his hypocrisy the real value of sterling virtue."—*Pioneer.*

The Foresters' Gazette.

BOMBAY, 22ND APRIL 1872.

INDIAN FORESTS.

The question of the forests of India, their maintenance and extension, we are glad to hear, received during the past year considerable attention at the hands of the Government. From the Administration Report of the Lieutenant-Governor, we gather that Lower Bengal possesses five forest divisions, viz., Assam, Chittagong, Cooch Behar, Bhaugalpore, and Dacca; these having during the last two years been wholly or partially surveyed, and selections made for the purpose of forming reserves. In the Chittagong division, tracts extending over 57,601 miles were duly gazetted as Government forests, and the same in the Bhaugalpore and Chota Nagpore divisions. Plantations have been extensively made in the Sikkim division along spurs of the Himalayas, also in Assam on the Dehring river in the Luckempore district, and in Chittagong. The latter-named division is stated to contain much valuable timber, with the concomitant advantage of the tracts in which it exists being drained by streams well-adapted for timber operations.

The area of country possessing forests of valuable timber has been found to be far more than was anticipated, but the destruction that has been going on for a length of time, if not speedily stopped, will soon render these tracts valueless. In Hazareebaugh, Lohardugga, and Singhbhoom, in Chota Nagpore division, this was most lamentably the case. The first-named district consists almost entirely of the Raingarh estate now in the hands of the Court of Wards, and although the value at present of the timber on it is but small, it yet possesses large blocks of land offering facilities for the creation in ten or fifteen years of plantations of young sal trees. Another tract of land to the extent of 149 square miles in the Palamow sub-division of Lohardugga, covered with young sal, has been reserved for a Government forest for home use, the situation being such as renders the timber of no value for exportation.

In Singhbhoom, there are extensive forests of fine sal in the territory of Urjoon Sing, the Rajah of Porahaut, who after a dispute with an Assistant Commissioner in 1858-59, was made a State prisoner, and sent to Benares, where he now remains. These forests are of very great value and comparatively easy of access. They have not been exposed to plunder and destruction as was the case with the forests in the Samda sub-division, where much of the good timber has been wastefully felled. These are all to be brought as soon as possible under conservancy, and possessing streams for transport, their value will be much increased in the course of a few years.

The oak and mangolia as well as chestnut plantations near Darjeeling, are, the report says, in good order, and it would be very advisable to extend the experiment as to the formation of such plantations elsewhere.

But although timber is the principal thing looked to in the conservancy of the forests of Bengal, there are various other kinds of produce from them, the value of which must not be overlooked. A revenue of Rs. 55,000 per annum is collected on gums, bamboos, grass, and silk cocoons, and this revenue, though small in amount at present, might be increased under proper management.

The results of the transactions of the Forest Department during the year have not been profitable in a pecuniary sense, but this was to be expected from the addition necessary to be made to the establishment in order to carry out the new rules for the protection and working of the forests. The receipts were Rs. 61,140, and expenditure Rs. 23,210, leaving a deficit of Rs. 23,210. There will be a greater deficit this year. Three additional Conservators were appointed last year, and more will have to be appointed, if the attempt to preserve anything like a supply of native timber be carried out in a way to be successful. But we hope that the new rules will be enforced with more energy than they were framed with activity. The Forest Act was passed in 1865, and it was not until nearly six years had elapsed that any rules under it were framed and published. This delay might perhaps be accounted for by the proposed amendment of the Act itself having been "long under consideration." *Festina lente* has been the motto of the Government in this matter. The Forest Act was passed in 1865; a draft of a new law "embodying provisions not embraced by the existing law" was prepared by the Inspector General of Forests in 1868; but was not proceeded with; and a revised draft Bill was circulated by the Government of India in 1870, and the opinions of revenue and forest officials asked upon it. Their reports have been received and forwarded to the Government of India with the remarks of the Bengal Government, since the close of the year 1870-71, and there the matter rested.

The provisions of the proposed Bill are calculated to effect the following objects:—(1) the regulation and settlement of forest rights in Government forests; (2) the levy of dues on timber imported from foreign territory, and the control of the transit of timber and other forest produce grown in other than Government forests; (3) the assumption of a right as Government property to all drift, stranded, and unclaimed timber, until other rights are proved in them; (4) the control, in special cases, of private forests, where the welfare of the country seems to demand such interference: and (5) the punishment of particular forest offences by fine, in addition to the confiscation of timber and implements. The fourth clause, giving power to interfere with the management of private forests, requires consideration in legislating, and careful handling in working, if it becomes law. The Lieutenant-Governor says himself: "the necessity of avoiding interference with the nomadic inhabitants will render anything like a rigid system of conservancy impossible for the present." This has reference to the Chittagong division, but it will also apply elsewhere; and the new Act, if it enables forest officers to meddle too much with private forests, will be productive of more evil than good among the Koles and Paques of Chota Nagpore.—*Daily Examiner.*

DUAL FOREST CONSERVANCY.

We notice in the recent number of that useful publication, the *Revenue Register*, an article urging the extension of tree-planting, as a means of improving the climate and fertility of the country, and pointing with approbation to what has already been done in that direction in some districts. The theory that trees gather and retain moisture in the soil, and so increase the means of irrigation and reduce the temperature, may be taken as tolerably well-established. As to the necessity of attaining these desirable ends, we are quite with our contemporary. But we shudder at the bare thought of the way he would compass them, and the agency, or rather the numerous agencies, he would have Government employ. "All departments should unite, Forest, Revenue, Public Works, and Police, in raising vegetation. . . ." So they should unite, all in Government undertakings. But then they don't. Never since departments were, have their Mofussil representatives united in anything except to abuse and despitefully use one another, jointly and severally; or agreed, save to differ. Common interest, as in ill-associated couples, forces the Magistracy and Police to get on somehow; and under peculiar circumstances, even the Collector and the Engineer cease to trouble one another for a time. But no other Department ever loved the forest, the Ishmael of the Madras Bureaux. The police distrest forest cases; the Engineer takes the Forester to mean a defaulter in the supply, a swindler in the price and measurement of timber. Against the Conservator, the Collector has run his most triumphant courses in defence of an oppressed people, and in vindication of his own authority. You can't make the others take to the forest, or approve of its existence. Perhaps our contemporary would have each department "raising vegetation" on its own hook. That would be confusion worse confounded. Much as the thoughtful constable, or the cultivated maistry, might do for the avenues on their beats, the result would not be worth the bitter fighting and vexation of spirit which such a bizarre distribution of duties would entail. We have had enough of dual forest extension, without making it plural.

No, *ne sutor ultra crepidam.* Let the forest do the forest work. Let it "raise the vegetation," and let the others look on and nourish it with the sunshine of their favour, helping when they are asked, and when they can. The police have quite enough to do, and the Collectors are already jacks of too many trades. It is a mystery that men who have so much and such interesting work to do, should wish to do others' work also. They certainly cannot do so, save at the cost of their own. Of course a good Collector takes an interest in his district forests, just as he does in the roads and bridges. But what we complain of is that instead of that interest, directing his zeal to the cordial assistance of the Forest Officer, it too often leads to his starting a Forest Department of his own; local forest conservancy meaning, as a rule, two-penny half-penny plantations here, stray topes there, disjointed avenues at intervals, spasmodic arboriculture of various shades of success, and struggling under the alternate enthusiasm and indifference of successive Collectors. Some of these latter affect fire-wood; others timber; the loftier think of posterity; the incorrigibles despise all three. But on undigested, rarely-completed schemes, they employ or mis-employ, a revenue staff, and squander in driblets local rupees which, properly handled, might soon be made reproductive. Meanwhile, the department which should conserve forests merely fells them. *This is the blot:* that while the Revenue Department in its own unsystematic, expensive way, conserves and extends tree-cultivation, the Conservancy Department returns a revenue, but does comparatively little conserving or extending. In fact we have the paradoxical situation of a skilled staff engaged in cooly work, while amateur foresters do the scientific work in their leisure hours. What then have we a Forest Department for? It is that a handfull of well-educated young gentlemen may fill their and collect flowering specimens for the [illegible] them from Ooty? It is to feed the [illegible] of future generations? Or have forest conservancy [illegible] any place among the objects of the department?

Up to the present, with the exception of Nellambur and the railway fuel tracts, what has the department done to replace the lakhs and lakhs of trees, by felling, though it is able to return a showy revenue? What is it doing to counterbalance the cotton-clearings, and the annual jungle-firing of the ghat slopes? In what way have the promises of the Secretary of State, in respect of conservancy, been realized? Or, were all those beautiful passages about "forest-clad hills," "gathered rainfall," "stored moisture," "improved atmosphere," "grateful posterity," only so much gay bunting at the inaugural statement of the "Indian Policy of the Administration?" And if the Department has done almost nothing, whose fault is it? Not altogether the department's; certainly not that of the District Forest Officers. To them planting is the pleasantest part of their work, perhaps because they have so little of it. Pleasanter than the trading-branch; pleasanter than fighting the unequal fight with the Collector and Engineer combined; infinitely pleasanter than felling, floating, dragging, or carting timber. Quite as pleasant, and perhaps as useful as gathering botanical specimens in the fever months, to enrich the pages of that valuable and elaborate production, the "Flora Sylvatica Indica."

Whose fault then is it? Partly doubtless that of Government, who still cry, "give, give," and insists upon a forest revenue. Partly again, of the head of the department, who might refuse to give, might remonstrate and fight. But chiefly we think the District Revenue Officers are answerable. These have disliked the Forest Department from the first. It is an *imperium in imperio:* it is to a certain extent independent of them, and it takes part of their dominion out of their hands. Then again some Collectors are in love with their own conservancy, and they puff it and praise it in endless reports, till they and the Board believe in it, and compare it with regular shop, very much to the latter's disadvantage. Now, for this very reason we say that local conservancy is an evil. Were it a dozen times as successful as Collectors wish us to believe it is, so long as it diverts money and energy from a large systematic undertaking and wastes them in holes and corners, without definite plan, it will be an evil thing. But we go further. We think that in three cases out of four, local conservancy has been an absolute failure, a deception, and a positive evil. A failure because there are no results; a deception because it pretends to be better and cheaper than it is. One of the usual features to which Collectors complacently request attention, is the inexpensiveness of their conservancy. But no notice is taken of the fact that no charge is made for the pay, batta, or what is still more valuable, the persuasive influence of the revenue staff, and its ordinary establishments employed on the work. And finally we think a positive evil because it takes good men—Revenue Officers to wit—from work they understand to work they don't understand; and because it engenders a petty rivalry opposition shops, and aggravates that dislike of the 'forest,' which shows itself in the lukewarm support, the grudged assistance, aye and the ill-concealed destructiveness which the District Forest Officers too often experience at the hands of their Revenue brethren. We do not accuse all Collectors of this spirit, any more than we say that all local conservancy has been a failure. We know what has been done in North Arcot and Tinnevelly, but if we are not mistaken Messrs. Robinson and Puckle made free use of what is obviously the proper agency, the forests' staff. But we say that, as a whole, local conservancy is not worth its candle; and the forest papers placed at our disposal indicate too distinctly the pretty general antagonisms of the two departments.

If ever this Presidency is to see anything like real large forest conservancy; if ever the repeated promises are to be redeemed; if any systematic effort is to be made to repair the work of devastation which has been going on unchecked for years, we must have something more than a mere reorganization of the special department. Either by placing the local Conservator under the Collector, or in some other way, the latter's reputation must be identified with forest interests. Not only must Government consent to surrender some immediate revenue; not only must the Forest Departments give up the axe and bill-hook for the trowel and the spade; but the Collector must be induced to hand over his poky little plantations, his nurseries, and his arboreta, to the scientific handling of professional foresters. He must give up the trumpery devices by which the Forest Officer's work is made a burden and a struggle. He must cease to delight in withholding land which the forest wants, or in hoisting the bogy flag of commercial rights whenever he has no other means of obstruction ready. Blot out that puny thing, local conservancy, as a separate life. Give the money, and the good will—blundering, ignorant, but still earnest good will—that fostered it back to the department, and then perhaps we may hope to realize the true object of conservancy, viz., a steady extension of forest area, and as ultimate consequences, cheaper timber, and an elastic revenue.—*Madras Mail.*

FORESTS OF MADRAS.

A Report on forest conservancy in the Madras Presidency has recently been issued by order of the House of Commons. Among the documents which it contains we find one from Major R. H. Beddome, Officiating Conservator of Forests, giving an account of the reserved Government forests in the Anaimallays District. These forests are at an elevation of from 2,000 to 2,500 feet above the level of the sea, and contain some of the finest teak and blackwood timber in the world. During the past year the forests have been worked much beyond the average annual production in consequence, chiefly, of some enormous demands for wood made by the Bombay Dockyard and Madras Gun Carriage Department. The plan of operations has been, Major Beddome says, to fell as many full grown trees as possible, leaving only a certain number of large trees to supply seed for reproduction. The working season in the Anamallays lasts for a very short period only—from June to November—during which time the forests are almost entirely covered with a dense undergrowth of grass often growing to the height of ten feet, and swarming with wild beasts and elephants. For the other six months of the year work is impossible owing to the severe jungle fevers. The wood cutters very often refuse to work on account of the large number of tigers and elephants which prove a source of endless annoyance. The report states that during last year the trees felled were usually about twelve feet in circumference, the smallest having a length of twenty-two feet. Some species of the large-sized trees are now becoming scarce, but the forests are full of teak saplings of from ten to twelve feet in girth. Major Beddome thinks that these forests, which are the finest in India, should be placed under a very strict conservancy system. A large amount of rosewood was obtained during 1869-70.

All the Cuddapah forests are under what is termed the "license and voucher" system. They comprise the whole of the forests on the hills and plains on both sides of the North-West line of railway running between Tripatty and Cuddapah, and are estimated to cover 250 square miles. During the year under review the hilly portions have been little worked, and, indeed, are at present in some parts almost inaccessible. The revenue for the past year amounted to a little over 80,000 rupees, half of which was realized by the sale of fuel for locomotives. Every holder of a small tract of land endeavours to make money by the sale of wood, and without the utmost vigilance on the part of the Government authorities clandestine felling is, the report says, likely to increase. Major Beddome's report contains the astonishing fact that if a native owns fifty acres of jungle land, he can place in the market an amount of wood equal to the produce of several hundred acres. His workmen invariably turn to the neighbouring Government forests and fell away at pleasure. It is moreover a difficult matter to catch them in the act, and when they are so caught, their master screens himself by saying that he had ordered his men to cut wood only on his own land. Numerous reserves and depôts have been established during the year in the districts of Cuddapah and North Arcot, in addition to a large plantation at Ghooty in the Bellary Range. In Salem, the most important work at present is the formation of a forest chart on a large scale, showing all forests, reserves, plantations, sites for reserves and plantations, &c., and private forests. Till this is completed the Conservancy Department will be unable to calculate the yield of locomotive fuel as regards future requirements, or to regulate the annual supply with reference to reproduction.

Major Beddome makes some very sensible and important suggestions with respect to the formation of a Forest School in which young officers could be instructed in the rudiments of botany and vegetable physiology before they are appointed to the superintendence of a forest range. At present the Forest Conservancy Department of Madras is worked under great disadvantages. Nearly all its officers and overseers, at first, are ignorant even of the very rudiments of arboriculture, and yet are entrusted with the charge of plantations and conservancy operations. Under the heading of "Forest Products" we find that large quantities of honey, wax, roots, fruits, gall-nuts, ginger, turmeric, cardamoms, dye-powder, resin, and various fibres are obtained yearly from the forests of the Madras Presidency. The sandalwood tracts belonging to the Government are confined to certain portions of the Coimbatore and Salem Collectorates. The tree is often found in hedge-rows and low scrub jungle, &c., but is seldom seen in any regular forest. Up to a few years ago, sandalwood was considered a Government monopoly; at least none of the ryots ever asserted a right to fell it when found in even their own fields and hedge-rows; but upon a Sub-Collector of the Salem district raising the question, the Government waived any claim to the trees, and they are now generally sold standing by the ryots, to merchants, &c., for a merely nominal sum. This, of course, gives rise to much smuggling from Government tracts. During the last two years there has been a general dying out of the large bamboos (*Bambusa Arundinacea*) throughout Wynaad, Coorg, South Canara, and portions of the Anamallays. Opinions differ as to the length of time this giant grass takes before it comes to perfection, but certainly it dies immediately after flowering. Major Beddome believes that there will be a great dearth of bamboos in nearly all the forests on the Western side of the Madras Presidency for the next two or three years. During 1869-70, specimens of the timber of some valuable new trees in Tinnevelly were forwarded for inspection to the Secretary of State for India. Seeds of several important plants and trees were also sent to Kew, and to different parts of India and the Colonies. The Conservator has, during his tours through the several districts, collected and dried a large number of specimens of new and interesting plants, selections from which have been sent to the Madras Herbarium and to England. Sandalwood planting has been successfully tried in the Cuddapah and Kurnool districts, and in the Seegoor and Collegal ranges of Coimbatore. South Canara is held to be a promising field for the extension of the experiment, as the tree is indigenous in portions of that district. The general results of forest work in Madras during 1869-70, judging from the voluminous reports, may be briefly stated as follows:—There were removed from the various forest tracts, 690,010 cubic feet of timber, 57,434 tons of firewood, and 33,913 cart loads of bamboos. There were prepared 10,504½ maunds of sandalwood, 11,61,700 lbs. of red sanders (a dye wood), and 1,588 telegraph posts. The expenditure of the entire department for the year was 2,86,691 rupees, and the receipts 4,95,789 rupees, or a profit to Government of considerable over a lakh of rupees, the largest amount yet realised.

On the 5th March 1870, Major Beddome forwarded to the Revenue Department a report of an exploration tour through the forest land of the Golconda talook in the Vizagapatam District. Starting from Krisnadevipet, he spent a couple of weeks in travelling over a considerable portion of hills and forests in the neighbourhood of Rampolu Ghaut. Major Beddome found the forests not nearly so rich in the number of species of trees, or in the variety of under-growth, as similar tracts on the Western coast. But some were rich in ferns, several species of which were unknown to Major Beddome. The rattan was very plentiful. Moss was abundant, and was found at a much lower elevation than in the Western forests; lycopods were also common. Major Beddome says that in his opinion, tea, coffee, and cinchona might be grown with considerable success in the hilly parts of the Golconda talook. Botanically, he did not meet with much that was new, except the ferns mentioned above, which belong to the following species:—*Niphobolus stigmosus Lastrea gracilescens, Diplazium tomentosum, Goniopteris multilineata*, and *Pteris crenata*.—*Friend of India.*

FOREST CONSERVANCY AND PLANTING

In our January number we publised a collection of papers on French Forest Conservancy, and in our leading articles of January and February drew attention to the importance of arboriculture in all climates, but more especially in tropical regions such as India. The subject is of such vast importance to this country that we propose to bring it again before the Government and the public, and will do so again and again until the idea thoroughly spreads and so fastens on the minds of all classes, as to bring about a hearty co-operation in the work of physical improvement.

In this article we would call attention particularly to the necessity of re-planting and re-turfing the hill sides in those central parts of the peninsula which, being remote from the sea, receive but a small portion of the moisture, brought up by the monsoons from the ocean and deposited on the coast lands, whose mountain ranges suck the winds dry ere they reach the interior. Take Bellary for instance. This inland district has probably the most scanty rainfall of all the districts of the Madras Presidency, and the town of Bellary itself is described in Thornton's Gazetteer as about the driest place in Southern India. Any visitor to the place must be struck by the dearth of vegetation in the cantonment and the surrounding country. Hedges cannot be coaxed to grow around compounds; roadside trees will not shade the roads; the wells dry up in the hot weather; and almost every year there is a regular water famine. This state of things has been growing worse and worse within the memory of man, or rather of the old residents, who bitterly lament the time when trim hedges surrounded the compounds, grapes grew luxuriantly in many of the gardens, and when the wells did not go dry, and did not require to be sunk so deep as now by several feet, in order to reach the water-bearing strata. And yet the average rainfall is about thirty inches a year, nearly as much as that of that moist country, Ireland. Violent thunder-storms and atmospheric disturbances with heavy showers occur during the monsoons, both of which affect Bellary. The surface of the country is seamed with the dry beds of torrents, and it was only last year that a mountain torrent, descending from the slopes of the mountain called *Sugalamma-betta*, about eight miles from Bellary town, washed away and killed several natives who were visiting a shrine in a glen at its base. Plenty of water falls if only it could be retained; but it falls on a naked surface and hurries in torrents into the rivers, which rise in flood and fall again in the space of a few hours; and the rain does more harm than good by stripping the good soil from the surface of the ground. Pour, say, a pint of water on a

sponge and on a stone-flag, and what is the difference? For a moment the stone-flag shows the most water, which streams across its surface and then all is dry again. The sponge shows but little water at the time, but it retains it and stores it for many hours. And this is exactly the same in the case of a wooded and a treeless country. In the latter, all the rain that falls rolls over the surface in torrents visible to all, but is gone in a short time; while in the former it goes we cannot see whither, but is really stored in the vesicles of leaf, stem, and root, and in the loosened and shaded earth, as in the cells of a sponge, against the season of drought. But besides acting as sponges for the storing of the fallen rain, trees act on rain as lightning-conductors on lightning, and draw forth the water from the cloud as it passes over them. Dr. Bidie has remarked, and we have ourselves witnessed the phenomenon, that cloud floating across two hills of equal height, one of which is wooded and the other bare, will pass over the treeless one but will settle gently on the soft leaves of the wooded one in misty rain. They thus increase the actual rainfall.

The cause of the deterioration of the water-supply in Bellary is not hard to find. The ryot's *kodawali* or small hill-hook, the herdsman's cattle and goats, have denuded the surrounding country of its trees and vegetation—*hine illa kachgynne!* In the adjoining talooks of Mysore the indiscriminate destruction of trees is much more strictly repressed, and the traveller sees the difference at once on crossing the boundary. At a recent boundary settlement the Mysore Amildar claimed, as we are told, a certain hill as belonging to his talook; "for," said he "look how many trees it has on it; you will find no such hills in Bellary." As the trees have been destroyed, the atmospheric disturbances on the approach of the monsoon have increased in intensity; the air has become drier in the hot season, and consequently it has been more fatal to the remaining vegetation; and the earth is parched to a greater depth than formerly, rendering it necessary to sink wells deeper and deeper every year.

The *Sugalamma* Hill already mentioned is the highest of a range of mountains known as the Copper Mountains, on the south-west of Bellary town. It is about 1,000 feet above the plain, and its sides are steep and bare, as are those of the remaining hills of the range. This range extends from a village called *Antapore*, in a south-easterly direction to the Bangalore road, which runs between its eastern extremity and the western end of a range known as the *Mincheri Hills*. These hills are lower, more rounded, and less steep than the others, and run in the same line up to the Haggri river, each range being about ten miles long and their average height some 600 feet. Were these hills carefully planted with the *Sunkeshwara Acacia*, the *babul*, the *umbrella-shaped babul*, and the *tamarind*, and were the existing trees, chiefly of the kind known as *nâr* (from the fibre which is obtainable from the bark), protected from their enemies, there can be no doubt that a great change would take place in the climate of Bellary; and the rains, instead of rushing in wall-like torrents with fronts of many feet in height down the hill sides, would be retained and stored for the dry season. A wealthy resident of Bellary, we are told, who possesses a house and property on the *Mincheri Hills*, was disposed to enter into the scheme of planting; but, as the project did not receive encouragement from those in authority at the time, he dismantled his house and abandoned the idea. We should be glad to learn that something had induced this gentleman to re-entertain the project, and become a pioneer in the physical improvement of Bellary.

All over the district are scattered isolated rocks from two to six, and even, as at Gooty, eight hundred feet high, whose sides are almost entirely covered with granite boulders, where one would imagine no tree-roots could find subsistence: yet even here the hardy tamarind and babul may be seen struggling into light from between huge boulders, and needing but a little protection to increase and multiply till the nakedness of the rock be clothed. To supplement this, creepers might be encouraged on rocks very devoid of soil. One species in particular, known as the *ekkeri gumpadi tige*, or jungle pumpkin, thrives on such places: its runners attain the length of some forty feet, and are about as thick as a man's thumb with fleshy leaves, almost circular, about nine inches in diameter. In some places, as in the case of the fort-crowned rock in the centre of the Bellary Municipality, which rises to the height of about 400 feet and presents in places a surface of bare and solid granite, the sloping rock might be covered with wicker baskets placed close together filled with earth, and each containing one or more shrubs or creepers.

We read lately a project for creating artificial springs at some of the hill sanitaria. The author points out that a spring is caused by water percolating through loose soil till it reaches the impervious sloping surface of a rock or other impenetrable stratum, along which it runs, beneath the soil, till tapped and brought to light lower down the hill side; that to imitate this we should place sheets of metal, the edges of the upper pieces overlapping those of the lower, like tiles on a house, a foot or two under the soil, and so cause the water to run along them beneath the surface to the place where the outlet is required. By our project, soil and vegetation would be placed over the impervious rock side, and the effect would be similar.

We agree with the writer of the article entitled "Dual Forest Conservancy," in a recent issue of the *Madras Mail*, that the proper agency for carrying out forest conservancy and planting is the Forest Department, in those districts where there are large forests in existence; and consequently a Forest Department has been created to look after them. We consider that every district should have its Forest Department, particularly those, like Bellary, which being destitute of trees require extensive planting; but while we must allow that perhaps it would be better to leave all planting to that Department, we feel sure that the no less important work of protecting the hills, on which jungle would if left to itself spring up, might be effected by the Local Fund Boards and Municipal Commissions, who might work through the agency of subordinate committees in the villages wherein the hills to be protected exist. Section 26 of Act IV. of 1871, states that the object of the creation of Local Funds is to carry out "local works of public utility calculated to promote the health, comfort, or convenience of the people." Surely, the planting of hill sides is such a work.

Throughout this article we have spoken of Bellary; but our remarks are capable of general application. We have taken this very extensive province as the immediate subject of our observations, as being perhaps more in want of arboriculture than any other district, and as being a place with which we have some local acquaintance. Really rich as Bellary is in actual wealth and position, it is derisively spoken of as only famous for three staples —"rocks, thorns, and goats;" but we trust that, by the combined and energetic action of private individuals, Municipalities, and Governmental encouragement, the slur will soon give place to the more pleasing characteristics of trees, water, and fruit, as of old. —*Madras Revenue Register.*

DISTRICT ARBORICULTURE.

From Baden Powell, Esq., Conservator of Forests, Punjab, to the Officiating Secretary to Government, Punjab.

I HAVE the honor to reply to your No. 238, dated 14th April 1871, on the subject of district arboriculture. The agencies by which the gradual planting of districts may be accomplished are—

(1.)—By the people themselves under (*a*) simple encouragement; (*b*) compulsion or compensation by law (including conditions in grants, &c.)
(2.)—By District Officers and Local Committees.
(3.)—By Canal Officers.
(4.)—By Public Works and Railway Officers.
(5.)—By the Forest Department.

I. (a)—Planting by the people under encouragement or compulsion.

This first when attempted has generally failed, but in the Ludiamah district it is said that 816 villages have plantations made voluntarily. I have not seen any *recent* report on the subject, and it would, I think, be very desirable if a brief note of the total acreage, number of trees per acre, prevailing kind of tree, how raised (whether by well irrigation or rainfall only), together with a note of the circumstances which induced the people to undertake the cultivation, were printed and circulated. About 266 acres in Jhelum district appear to have been planted in the same way.

It would also be well to enquire in what districts the order of the Board of Administration (that at every three miles along main roads grove plots might be given rent-free, conditional on sinking a well and planting a grove), and also F. Circular 72 of 1868 has been acted on, and how many such grants have been made, and with what result? It would seem unlikely that the results would be sufficiently profitable to induce many applicants to come forward to District Officers. As to (*b*), various efforts have been made from time to time to utilize settlements as opportunities for introducing conditions as regards planting and preservation of trees. The Circular (Board of Administration No. 15 of 1852), is not in the hand of all District Officers, might be reprinted.

(i)—As regards Settlement arrangements, it was agreed that lands planted were to be relieved of assessment if not at the time yielding a return.

(ii)—It was also ordered,—"in forming the new Settlement, Officers engaged shall require the zemindars receiving *inams* from Government, to raise one kanal (½ biga) of young trees annually for sale or distribution among their tenants."

(iii)—In a circular of 1864 (No. 15) the Financial Commissioner urged planting trees at "sihaddis," or points at junction of three or more villages.

(iv.)—The Financial Commissioner has also called my attention to the Circular 64 of 1864, in which the Government of India sanction a limited area of land to be *freed* from assessment, if planted with "approved" trees.

I have no information as to what extent any of these four orders have received application. If I may offer some practical suggestions, I would say that in all the present revisions of Settlement, it might be seen that some of these principles have received attention, especially Nos. I. and IV. I would suggest that the rule about trees at "sihaddis" should be absolutely enforced, and distinct reports of its being carried out required by Deputy Commissioners, who might hold village durbars or kamangos, &c.,

[illegible] so, we shall not only should [illegible] but that some of trees be planted (where [illegible] render it possible) to mark the boundary [illegible] village or estate, and that the villagers should [illegible] to the 'wajib-ul-arz' to maintain and not to fell [illegible]. I should not be disposed to make any condition about fruit-trees. Whatever we can get is an advantage, the prospect of an income from a tree is of itself a strong inducement to plant.

I think that the influence of the Settlement Officer could without any difficulty, and by consent of the khetwatdars, induce such an arrangement; the good effect in preventing boundary disputes need not be remarked. It may be worthy of consideration, whether, when the new Settlement and Revenue Acts are drafted, legislative sanction to measures of this kind should not be entered specifically. As regards No. II., the rule as it stands does not seem very practicable. It would be much better if it were made an absolute condition of all muafis and jagheers (for whatsoever purpose granted) that the grantees should maintain not merely a very small nursery, which involves the trouble of perpetual cultivation (as the trees are to be sold or given away as soon as fit), but simply to maintain a grove of trees, which should be not less than an acre or more according to the extent of the grant. And I think it might be recognized as a principle that trees for transplanting are to be given free to everyone (whether bound to plant or not), and that, for this purpose, nurseries should be maintained in various parts of all districts at the public cost (which would be very small), and that not only so, but Canal Officers and Forest Officers should give freely from their plantations and nurseries. I have always made a practice of this in my department, and many plants have been given from our great plantation at Changa Manga, and some also at Lahore. Another condition imposed by B. A. Circular 15 of 1852, was that all new cuts from canals be only made on the zemindars agreeing to plant both sides of the water-course with trees at intervals of 14 feet. It is not known whether this has ever been carried out, but it is worthy of remark that Canal Officers themselves will not allow trees on the banks of *some* canals and smaller cuts, and immediately root them out on their appearance. I am not aware whether the reason of this and the circumstances under which it is carried out are on record.

While on the subject of tree-planting, by compulsion of law or agreement, I might also mention that the price of Government fuel and trees is said to have caused village trees to be cut in some districts. Wherever this is reported, it ought to be very carefully enquired who are the people who purchase the trees, and for what purpose, if they are cut sufficiently near the great centres of *fuel* demand; it must then be seen at once what are the resources of the rakhs in private or communal hands, as well as in the charge of the State, and whether the supply thence could not be enlarged and the rates lowered. If cut for *timber* for local use, it may be due to high prices put on forest trees. A case of this in Hushiarpore is brought to notice, but before rushing to a conclusion and lowering the price of trees which are at any rate themselves saved from cutting, it is necessary to be extremely accurate as to *causes*, lest the result should be that *both* kind of trees are destroyed instead of one.

Under all circumstances it seems to me very desirable that in the new Forest Act a power should be reserved to the Local Government to protect village groves and trees in fields, either by prohibiting their felling altogether, or by making it conditional on replanting, or by fixing a scale of rates, this power to be exercised in such districts as the Lieutenant-Governor may deem necessary, where destruction appears threatened. This is to a certain extent an interference with private property, but in the first place it is or ought to be recognized in such questions that a limited interference with private rights for the public good is warrantable; and secondly, that the principles of political economy, which in Europe might seem to withstand such a course, have under totally different conditions of civilization and of the moral phenomena of feelings and principles, no application in this country, or at best a very modified one.

Perhaps under this head also I might bring a subject which deserves to be understood,—*viz.*, the right of Government (which has in some districts been maintained and acted on) to appropriate and plant newly-formed alluvial lands. The circulars on which this subject depends are, Board of Administration's Circular 60, of 26th November 1855; Financial Commissioner's Circular 03, of 1855, and the same, 18 of 1854. It is to be observed that none of these have the force of law. But it is clear that none of them contemplate asserting the rights of Government to take such lands as its own. The circular does indeed say in para. 4, "where the area * * * is large * * * the right of the village to the possession of the whole may well admit of question." I fear, however, that Regulation XI. of 1825, which absolutely enforces a well-defined custom where such exists, and lays down certain rules where it does not, leaves but little room for such question. The only case in which land might belong to the State (excluding of course alluvion to existing Government estates), would be where an island is formed separated from the estate on either bank by a stream which is at all seasons unfordable. Not to prolong a discussion of details, I think a careful study of the circulars and of their allusion to the payment of compensation will lead to the conclusion that the real meaning was to call attention to the fact that "bela" lands and alluvial accretions often occur of such extent that it could be no hardship to take up for public purposes (of planting) a portion of such lands, and that in such cases compensation would only need to be moderate and limited, or in other words, that whereas Government would generally disapprove of taking up private cultivated lands, it would approve of such being done in the case of extensive formations of alluvial soil.

Nothing more than this can safely be argued from the circulars, but to this extent they ought to be acted on, and on three of the rivers (Ravi, Jhelum, and the Chenab), the Forest Department will always keep a sharp look-out for any available "sailaba" or "bela" lands, as it is now beyond question that these "sailaba" plantations are the only resource we have in the Northern Punjab, (where there are no canals) for artificial plantations of railway fuel on a *large* scale.

ARBORIC CULTURE IN THE PUNJAB.

Mr. Baden Powell has published a most interesting paper on the introduction of foreign trees and those of other districts of India into the Punjab. It is not a disquisition upon the history of acclimatization, but a practical essay calculated to be of real use to Punjab forestry, and setting a very noteworthy example to the department in the Central Provinces, upon which Colonel Keatinge commented so unmercifully a few weeks ago. Acclimatization is an expensive hobby, and we are glad therefore to see that Mr. Baden Powell carefully bears in mind the intrinsic values of the trees he recommends for experiment. Had Lord Napier of Madras been the Conservator of Forests in the Punjab, we might have looked for the plantation of acalias on mountain sides, the propagation of blue bells on river banks, and of heather (an experiment actually instituted at the public expense in the Punjab) on desert wastes. Had the forests been in the hands of certain chiefs of the Etcetera Department, we should probably have had growing descriptions of moribund nurseries of hazel nuts, tanks for the cultivation of the edible lotus, and the growth of magnum-bonum plums. But in the Punjab the department is in safe hands, and the recommendations made are for such vegetables as the gum *Eucalyptus*, the hardy and valuable larch, the *Wellingtonia gigantea*, the toon, the dhaman, the *acacia stipulata*, the olive, and most especially the Spanish chestnut. There is now, for we have seen it, a specimen of the Spanish chestnut flourishing at Almorah, others are doing well at Dalhousie, at an elevation of 6,500 feet; but the tree will, we know, (from the experiments of Mr. John Strachey), succeed well at far lower elevations, and this being the case, there can be no doubt but that the Spanish chestnut, as a remunerative tree, stands the very foremost of all. The fruit of the chestnut is a staple in Spain and Italy, and the natives of this country (for it has already appeared in the bazaars as an article of food) pay an almost extraordinary price for it. "In many parts of the Punjab the miserable inhabitants live, says Mr. Baden Powell," on the poorest grains, such as amaranth and buckwheat, and are often driven to eke out a slender subsistence with the horse-chestnut soaked for many days in running water to remove its acid bitterness. Other districts are dependent on the turpentine-tasting seeds of the edible pine—to such people what a boon would the soft, sweet, wholesome chestnut prove." The *Wellingtonia* with its gigantic masses of timber if introduced, might prove valuable, and that it will grow in the Punjab is certain from the success of Mr. Duff, at Monali. The larch not only yields a valuable bark for tanning, but also the Venice turpentine of commerce, and deserves therefore the prominence accorded to it. It is a very rapid grower, delights in steep rocky sites, and does not object to extreme dampness, as is proved by its introduction on a large scale in the Duke of Athol's estates at Dunkeld, than which a wetter climate could scarcely be selected. Of indigenous trees, Mr Baden Powell especially draws attention to the toon, dhaman, and *ore*— all of which are valuable and grow with little trouble. Experiments with the teak and sal are discouraged, as neither, it is feared, can be reared with satisfactory results.

At the conclusion of his paper, Mr Baden Powell points out the causes of previous failures in acclimatizing experiments, with suggestions for their remedies—*1st*, the despatch of seeds or plants is so irregular and so ill-managed, that they seldom arrive at the right place at the right time; but this can be effectually remedied by placing the Conservators of Forests in direct communication with the sources of supply, and rescuing them from red-tape delays. In the *2nd* place, it is recommended that all *forest officers* should be enjoined to establish a regular system of seed-collecting, not only in the hills, but in the plains, so that in proper seasons the chiefs of the department may be able to put their hands on large and well-selected supplies; *3rd*, in every division one or more organized nurseries should be established, to which seeds can be regularly sent, and where a register of successes and failures can be faithfully kept. These are simple and practical suggestions of value, not only to the Punjab but to every Forest Department in the country.—*Pioneer.*

ARBORICULTURE.

The relations of the Forest Department with other branches of the Government services of these provinces are sketched with a masterly hand, and while hesitating to assent to everything urged in behalf of the forests, we cannot help admiring the genuine good style of the writer who clothes his subject in a charming and persuasive style which is all his own. There is much in the Conservator's remarks upon the rules in force for encouragement of planting by villagers and road-side proprietors of land, which might without much difficulty be made to apply to the Forest Department itself. For instance, it might very advantageously be made imperative on the department, that when a tree is felled a certain number of saplings or seedlings shall be planted out to replace it. The slowness or neglect of the village people is forcibly dwelt on by Mr. Powell in a manner that leaves room to wonder that similar injunctions are not more regularly enforced in the districts under his immediate control. The right of Government to "Chur" or "bela," or "sailaba" lands is one of the first things handled, and it is generally taken in an assumptive manner which strongly reminds the reader of the assertion by Government of a proprietary right in the waifs of Punjab rivers, to which the feudatory Governments assert a prior claim, which is in our estimation not a valid one. Mr. Powell further goes on to indicate the facilities for remedying all deficiencies in planting, and in somewhat curious style of reasoning would make all such duties devolve on the Irrigation, the State Railway, in fact any department except the one which owns him as its chief.

Departmental returns are criticised in a spirit which might have led to more effectual results. Given the amount of intelligence at Head-Quarters it is impossible to escape the idea that subordinate officers might have been kept closer up to the mark than the evidences of the report would convey as a fact to an ordinary comprehension. Admitting certain well-defined necessities of the department, how is it that an able management could not make sure of their being attended to?

What occurs to us very forcibly after a patient perusal of Mr Baden Powell's lengthy communication to Government, is the number and frequency of his suppositions and "ifs." There would really appear to be so little known for certain, that it looks like a puzzle how the affairs of our woods and forests have been accomplished at all. Is it to be understood that all forest administration is yet in its infancy, and this under the supervision of such an unrealizable galaxy of talent?

Here is practical advice:—"Always grow the best trees. Keekar should be grown for its value and its being raised from seed without irrigation. Grow 'toon' where possible, and 'shisham' (avoiding for it hard bad soil), and 'nim'; also for avenues 'jaman'; avoid mulberry trees if a handsome avenue is wanted, but for ordinary district purposes they are not to be despised. Bukain and siris are fair trees for shade, especially the tall variety of siris (*acacia elata*) the 'safed-siris' or 'baro' of the Dhûn. "About Delhi, the tamarind and the 'mimusops'* can never be grown too largely. The tamarind does well also at Ambálah." Our next quotation tends to something more ornamental:—"A few words may be added about station planting. Every station might, I think, have a public garden, small or large, according to the size of the place, in which there should be a nursery not only for growing ordinary trees, but for getting up the rarer and better sorts in pots. Avenues in stations are requisite, and they should be made by transplants, remembering that the harder the soil, and the worse its quality, the cheaper it will be in the end to make the holes very deep, and work and loosen the soil thoroughly. A higher rate for such transplants should not be grudged. Good trees should be selected, and if a tree fails or gets nibbled by cattle, it should be taken out at once and a better one put in."

His Honor the Lieutenant-Governor of the Punjab has read this report with great interest and has reached a conclusion regarding it which must be very satisfactory to its author. Government goes to the extent of offering an honorarium to any of its officers who shall perpetrate a manual of instruction in the art of growing trees, and if there be a genius in the ranks of the Forest Department, this is his opportunity.—*Indian Public Opinion.*

* Species:—M. Kauki; M. Hexandra, called "Khirni."

Official Gazette.

BOMBAY, 22ND APRIL 1872.

COTTON CULTIVATION IN EGYPT.

It is usual in the winter or early spring to till the land several times with a primitive kind of plough, and in the month of March to work it into ridges of about 3 feet apart. In April the seed is steeped for 24 hours in water to soften it. It is then sown in little holes scraped or made with a dibble in the sides of these ridges at about 18 inches distant from each other. In each hole three seeds are placed and then covered up with earth. The plants are irrigated once every ten or twelve days. When they appear above the soil, the superfluous ones are uprooted, only one or two are left growing from each hole. The fields are then weeded, and irrigation is continued every 12 or 15 days. In the month of October, the first pods are gathered as they ripen, through the months of November, December, and January. About 2 bushels of seed are sown per acre, but this is in reality a much larger quantity than necessary. The yield in well-cultivated land is from 10 to 12 cwt. per acre, but the ordinary yield is not more than about 6 or 8 cwt. Some cultivators have tried the plan of not watering the plants after the first gathering of pods, but the general opinion seems to be that irrigation ought to be continued. The cotton referred to is that which is now commonly known in commerce as Egyptian cotton. It is not that which was originally indigenous in Egypt. It is the produce of seed originally imported from the Sea Island and other ports of America.

On well-cultivated properties, the same land is only appropriated to cotton once in every three years, the crop being exhaustive. Much of the ground is flooded at high Nile, and the water allowed to remain on it until the river falls; it thus derives the benefit of a copious absorption of alluvial deposit, and when the water recedes, it is exposed to the sun until the surface is in a condition to be well-worked by ploughs and harrows. This is done three times in January or February, the ground being made as clear as possible, and finally turned up into drills; then, if artificial means of irrigation exist, the water is let on ten days before the sowing, and while the earth is yet moist, holes are made to receive the seed. About five grains are dropped into each hole and then covered up. It is well to soak the seed in water for 24 hours, but the practice is exceptional. A better result, however, is arrived at on good land where a much smaller quantity of seed is used, and the holes are made wider apart. For this reason the superabundance of plants have to be thinned out involving considerable labour, and when the trees are too crowded, neither air nor sun can enter freely to mature the cotton crop early. The labour of picking is also far greater when sufficient space is not left between the rows, as the children break the branches in their efforts to struggle through them.

The best period for sowing is considered to be from the 25th of March to the 20th of April, but in the neighbourhood of Cairo, and in the warmer provinces, a much earlier period may be adopted with success, whereas in "Behera" and on cold poor lands, the latest sown fields often present the most forward appearance in June. There are two systems of cultivation,—one called "Rahip," or by the natural inundation of the Nile; the other "Misgoweh," where pumping engines, water-wheels, and other artificial aids are resorted to, and by which water is let into the drills every 10 or 15 days in the early stage of the growing crop, and frequently at intervals before the Nile rises to a height sufficient to supply natural irrigation. A fair average crop is of 300 lbs. of clean cotton to the acre, but on good land as much as 900 lbs. per acre is known to have been raised.

Three hundred and fifteen lbs. of common cotton in seed should give 100 lbs. of clean cotton, but the finer descriptions show a less favourable render, and 315 lbs. of the finest Sea island cotton in seed would probably yield about 80 lbs. of clean cotton. When the trees have a tendency to grow too tall, they should be topped with a pruning knife which causes them to throw out robust lateral branches. The gathering begins early in September, and the great picking is in October and November. The last pickings are in January and February; the trees are then cut down or rather uprooted. Great care should be bestowed on the separation of dead and discolored cotton from the first quality. This ought to begin in the fields; the children employed in gathering it working in threes,—the first taking the clean, white, well-opened pods, the second any discolored ones and what may have fallen and got mixed up with leaves, and the third the refuse and pods which would never open properly from blight, insects, or cold fogs.

The gins best suited for Egyptian staple are those made by Messrs. Platte Brothers, of Oldham, 40 inches wide and driven by steam at 600 to 800 revolutions in a minute.

MR. LOGIN'S EXPERIMENTS IN GROWING COTTON ON THE EGYPTIAN SYSTEM.

From H. Ricott-Carnac, Esq., Commissioner of Customs and Commerce with the Government of India; to the Secretary to the Government of India, Department of Agriculture, Revenue, and Commerce, No. 55, dated Allahabad, the [illegible] December 1871.

I have the honor to report that in accordance with the instructions of His Excellency the Viceroy and Governor General in Council, conveyed in your letter dated the 1st [illegible], I have visited the several experiments undertaken by Mr. Login, C. S. I. R. S. R., in growing cotton in the Delhi and Ambala divisions, and I have now to submit, for the information of the Government of India, the report called for in your letter under reference.

[illegible] which [illegible] described the several experiments [illegible] from Delhi to Ambala. The [illegible] in the reverse order, i. e., on my journey [illegible] to Delhi. It will, however, perhaps be convenient [illegible] observed by Mr Login, and I propose, therefore, [illegible] notice the experiments at the Delhi end [illegible] Grand Trunk Road.

The first experiment is that at the Rai-Rest-House, 20 miles from Delhi. A portion of the compound which surrounds the large [illegible] built for the accommodation of European troops at Delhi, when the cantonment is unhealthy, has been taken up for the purpose. The soil is quite up to the average of that of the surrounding country. The area of the plot is rather more than ¾ of an acre. The plants, in this and all the experiments, were raised from indigenous seed. I found them to be exceedingly fine, and I have no hesitation in saying that they were superior to any cotton plants I have seen in India. They were strong and well-formed and as they had been carefully "topped," the plants had thrown out healthy branches which were well-covered with young bolls. On one of the plants I counted seven main branches with 58 bolls, and although this was, perhaps, rather above the average, there were many plants up to this standard. There was but little ripe cotton on the plants at the time of my visit, as the picking is carried on steadily, as quickly as the pods burst. Mr Login informs me, however, that up to the 11th of December 273 lbs. of cleaned cotton had been picked from this plot of ¾ of an acre,* or at the rate of 365 lbs. to the acre: as regards the quality of the cotton, I shall refer to this subject after describing the experiments at the several plots, for the remarks under this head apply to all the experiments alike. The treatment of the plants was that described by Mr. Login in paragraph 4 of his report. The seed had been planted in ridges at a distance of 3 feet by 2 feet, and plenty of space had thus been left for each plant to spread: and it is right to add that the growth made had been so satisfactory, and that the plants had filled out so well, that no space had been wasted by this arrangement, as is often the case when the growth of the plants is inferior, and the space left between the rows large. The soil, as mentioned by Mr. Login, is good, and had had the advantage of not being worked for several years. No manure was applied. It was weeded four times and watered six times. The irrigation had been carried on from a well situated just outside the boundary of the compound. The well is the property of one of the lumberdars of the village. This man had irrigated the adjoining patch also, which he had sown broad-cast with cotton according to the native method. The proximity of these two patches of cotton cultivation, the soil of which is identical, and in which the same sort of seed had been sown, afforded an excellent opportunity of comparing the merits of the two systems, and the superiority of Mr. Login's plants was very striking. The plants in the field sown according to the native fashion, though tall, had not branched freely, and the yield of cotton from such a field would certainly be less than one-half of that which would be gathered from a field of the same area containing plants like those in the adjoining Rest-House compound, cultivated on Mr. Login's system. And I am bound to say that the lumberdar's irrigated field again was far superior to the average of the native fields visited by me on the road, many of which, however, had not had the advantage of irrigation.

The next experiment visited was that near Lurowlie about 32 miles from Delhi. The experiment is a very small one (¼ of a beegah), and has been undertaken by a native cultivator. The soil is good, and the field had had the advantage of irrigation from a neighbouring well. The seed had been sown, and the ridges had been thrown up in the manner advocated by Mr. Login. The plants were green and healthy, well-clothed with foliage and bolls. No cotton had been picked, as the sowing had been unfortunately late, and the plants were backward. There is some fear of the crop suffering from frost, and the unripe bolls had suffered slightly from the boll-worm. One low well-branched plant in this field had 46 bolls on it. Mr. Login has not given me the quantity of cotton picked from this plot. But even if the yield is small, the experiment can scarcely be considered a fair one, as the sowing took place too late to admit of a favourable result.

I also visited the small plot belonging to Saboo, a cultivator of Dundoree on the Grand Trunk Road at the 102nd mile from Delhi, and 18 miles from Ambala. The area of the plot is ¼ of an acre; the soil is good, and it was watered by a well situated within the enclosure. The plot had been manured and the weeds had been carefully removed, and the plants had been tended according to Mr. Login's directions. They were in good condition, though [illegible] inferior to those at Rai. The experiment had however [illegible] from the sowing of the merkandee. Up to the 11th of [illegible] this field had, Mr Login informs me, [illegible] the previous, and more cotton is expected [illegible] this field. This experiment again can hardly be said to have received fair play, as the heavy flooding it received from the river undoubtedly affected the out-turn.

The field at Shahabad is the property of one of the lumberdars of the village, and is favourably situated just outside the town. It has a well in it, and it is certainly one of the best patches to be found in the neighbourhood. The area of it is [illegible] of an acre. Next to the plot at the Rai Rest-House, this is the best field I saw. The soil is good, consisting of a light brown friable sandy loam of a depth of about 5 feet. It had been well-manured, and carefully weeded. It had been three times watered. This field, although cultivated on the same system, had not filled up so well as the one at Rai, mentioned in paragraph 3 of my report. A plant scarcely above the average was 3½ feet in height, and had 34 bolls. Care had been taken to "top" the plants, and to keep them from growing too high. The ripe cotton had all been picked. The roots of a plant 6 feet high were examined, and it was found that the top root measured 2 feet 4 inches, exclusive of about 2 inches which had been broken off at the tip in removing it from the soil. The roots ramified freely, shewing a sufficient amount of nutriment near the surface and a well-worked soil. Mr. Login informs me that up to the 11th instant this field had produced clean cotton at the rate of 201½ lbs. to the acre. As in the instances already noticed, the plants in this field, on the system recommended by Mr. Login, were found, to be much superior to those in the adjoining fields.

I also visited the plot situated in the compound of the Rest-House at the 111th mile from Delhi, and 9 miles from Ambala. The soil is good, and until the present experiment was commenced had not been touched for many years. The area of the experiment is [illegible] of an acre. The plants were fine, the system of cultivation was the same as that noticed in former cases, with this exception, that the plot had not been irrigated; nor had any manure been applied this year. The plants were good, but inferior to those at Rai and Shahabad. They had been carefully "topped," and had branched freely. I hear from Mr. Login that up to the 11th instant, clean cotton at the rate of 102½ lbs. per acre had been gathered from this field.

A native field, in the immediate proximity of this plot, was examined. The plants showed an inclination to branch, but as they had not been "topped," they were somewhat lanky in growth. Two of the best plants examined had respectively 41 and 52 bolls, but these were exceptional trees and well above the average.

I also visited several very small patches, situated in the compounds of bungalows between the last-mentioned Rest-House and Ambala. The plants in all of these were very much inferior to those already noticed. I have received no details from Mr. Login regarding the yields from these plots. As explained in Mr. Login's report, these last-named experiments have had to contend with many disadvantages, and have been much damaged by the floods. And, moreover, although the land is good, and has been little worked, the plots are too much hemmed in by trees to admit of satisfactory growth. They ought therefore in fairness, to be put out of consideration in noticing the success of the experiments.

The quality of the cotton produced, and the proportion of seed to cotton, has now to be noticed. I myself picked a small quantity of kuppas or cotton in the seed from Mr. Login's experimental plot at Shahabad. The kuppas was cleaned in my presence and gave the following results:—

	Quantity of kuppas.	Quantity of seed.	Quantity of clean cotton.	Percentage of fibre.
From Mr. Login's field	42 tolas.	29 tolas.	13 tolas.	31 per cent.

Some of the first pickings cleaned by Mr. Login gave rather a more favourable result, the proportion of cotton to seed being, if I remember right, nearly 33 per cent. This is a high percentage.

I also picked, at the same time, some cotton from a field cultivated on the native system. This, on being cleaned, gave the following proportions of seed and cotton:—

	Quantity of kuppas.	Quantity of seed.	Quantity of clean cotton.	Percentage of fibre.
From a cultivator's field	9 tolas.	6·5 tolas.	2·5 tolas.	about 28 per cent.

The cotton in question was about the average of the native fields. The cotton grown on Mr. Login's system thus shows a superiority of 3 per cent. in the proportion of cleaned cotton to seed, and this is doubtless due to careful cultivation.

It may be convenient here to shew, in a form of a statement, the results of the principal experiments undertaken by Mr. Login at the spots visited by me. These are given below. And it is to

* [illegible] by Mr. Login, in [illegible] but as [illegible] the contrary [illegible] which is [illegible] possible [illegible] of an acre.

be borne in mind, with reference to the figures therein contained, that the yield of clean cotton entered in column 5, represents only the amount picked up to the commencement of this month. Mr. Login has been requested to send further particulars, which will be duly communicated to you as soon as received.

Number of field	Distance from Delhi	[illegible]	Yield of cotton per bigha [illegible]	How treated	Est. yield of clean cotton per acre, up to the middle of December	Remarks
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Soil good average. Had been under grass for several years. Plants extremely fine.
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Since rain, adjoining by a little, was late in the season.
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	The property of the lumbardar. This has also suffered from irrigation.
5	[illegible]	Red Hedge	[illegible]	[illegible]	[illegible]	In the compound of the Rest-House the soil had not been worked for years.

Highest yield [illegible] lbs. Average [illegible] lbs. to the acre.

Next as regards the quality of the cotton. That grown by Mr. Login was carefully picked and cleaned, an advantage the native cotton seldom enjoys. Certainly, so far as cleanliness is concerned, it was far superior to ordinary native cotton brought into the market. The superiority in this respect is however to be credited to the great care taken in the preparation of the cotton, which on Mr. Login's experiments, was carefully picked day by day as the pods burst, and none of which was allowed to fall on the ground and to lie there for several days, as is too often the case in the native fields. Native cultivators who grow cotton on a large scale cannot, as a rule, afford to entertain the labour necessary to prepare cotton in this manner, and they wait until the grain crops are cut, and labour is comparatively cheap, and then have their fields picked by contract.

I cannot say that, so far as the length of staple is concerned, I detected any marked superiority in the cotton that had been carefully cultivated. Nor, may I add, has this object been attained elsewhere. Specimens of Mr. Login's cotton and of the ordinary native cotton, have been sent to the Chamber of Commerce, and the opinion of these bodies on this subject will, when received, be duly forwarded for your information.

The above remarks have had reference chiefly to the yield of cotton on the experimental plots cultivated under Mr. Login's direction, and it will hardly be contested that, so far as the yield is concerned, these experiments have been a marked success. For, as the statement at paragraph 11 shews, Mr. Login has succeeded in raising as much as 305 lbs. of clean cotton to the acre, whereas the average yield of four fields was at the rate of 223 lbs. to the acre. This is certainly a very large yield, the average yield from native fields is generally considered to be 80 lbs. to the acre, and this estimate is most probably above the mark, and in Upper India the average out-turn to the acre is, perhaps, hardly more than 60 lbs. In the rich valley of the Poornah the yield per acre is placed at 100 lbs. during a good season, and even this figure is, if anything, rather high. Careful experiments have been made on the farms in Berar during the past three seasons, and our highest yield was in the case of a field at Sheagaon, noticed below:—

"No. 10 sown with Hingunghat cotton gave the largest yield of any. The area was 1 acre, 10 poles, and from this alone 925 lbs. of kuppas was picked which gave 270 lbs. of cotton. The field was however land that had been lying fallow for years. It was besides thoroughly ploughed, and the immense yield can hardly be taken as a fair criterion. It serves to shew, however, what the indigenous plant can do in good soil. It is worthy of note that this field was hardly touched by the caterpillar, and out of the 925 lbs. of kuppas only 90 lbs. were classified under 3rd quality. This is only to be accounted for by the fact of the plants having matured more rapidly than the others, so that when the caterpillar came in numbers, the bolls were too far advanced for their taste." The field was not watered or manured. Still this experiment was on rather too small a scale to be satisfactory, and in the Central Provinces and the Berars the experimental fields are seldom less than five acres.

I am not unprepared to hear it argued that these experiments of Mr. Login's have been conducted under favourable circumstances, and that from trials made on so small a scale, it is not possible to judge of the amount of success that would result if the system were generally adopted. Now, if such an argument were advanced, there would be a certain amount of truth in it. And I think it well to look such objections in the face, and to try and ascertain to what extent such arguments bear on the subject.

First as regards the season. The season has been by no means a particularly favourable one. On the contrary, the exceptionally heavy rain which fell early in the monsoon throughout Upper India, was very trying to the cotton crop, and many of the fields, as already noticed, suffered severely from the floods. The monsoon throughout Upper India was very trying to the cotton crop, and some of the fields of Mr. Login's experiments, as stated in an earlier portion of this report, suffered from the floods. So the experiments can hardly be said to have been unduly favoured by the season.

Although the experiments had not the season in their favour, still it may fairly be said that the large yield obtained by Mr. Login is, to some extent at least, to be attributed to the advantages of soil, manure, and irrigation, which most of these experimental plots enjoyed. As far as soil is concerned, I should say that every plot was certainly equal to that of the best native fields. In the experiments at the Rest-House the soil had not been worked for years, and this circumstance undoubtedly had its effect upon the yield. Plots 2 at Lursowlie, and 3 and 1 at Duntoore and Shahabad, belonging to native cultivators, were certainly as good as could be found in the neighbourhood. They were in all three cases the property of the lumbardars, who do not pick out the worst land for themselves, and each plot had a well in it, and a well is generally put where the soil is good. Having no experience of the Punjab districts, I speak with some diffidence on the subject, and I may, perhaps, be incorrect in considering that these fields were quite the best that could be selected. But they certainly reminded me of what in the Central Provinces would be called the zemindars' *Kuree* field, which, being generally the best in the village, is devoted to the growth of garden produce.

In regard to manure, it will be noticed that in cases of fields Nos. 3 and 4, manure was used. It is difficult to say to what extent, exactly, the success of these experiments is due to this fact, but as is well-known the scarcity of manure is one of the great difficulties in Indian agriculture. If the success of this system depended on the free use of manure, there would, perhaps, be little hope of its general adoption. But it is to be noticed that fields Nos. 1 and 5, which yielded 365 lbs. and 192½ lbs. respectively were not manured.

Then, as regards irrigation, it will be noticed that fields Nos. 1, 2, 3, and 4 had the advantage of several waterings. Here also it is impossible to say exactly how much of the success is to be credited to irrigation, and it must be admitted that if irrigation is absolutely necessary to its success, then this system can be made applicable to but a very small portion of the cotton-growing country. On the other hand, it is to be noticed that field No. 5 enjoyed neither the advantage of manure nor of irrigation. And yet the yield up to the 11th December, was at the rate of 192½ lbs. per acre.

But I think that the chief advantage the experiments have enjoyed, has been the intelligent supervision devoted to them by Mr. Login and his subordinates, who have followed the example of their chief, and have gained considerable practical knowledge, and evinced great interest in these improvements in cotton cultivation. And it has specially to be noticed that these experiments, which have been conducted with great care and which have been very perfectly supervised, have been on a very small scale; the largest was but ¾ of an acre. I may be wrong; but to this intelligent supervision and careful cultivation of the plants on good soil, I am inclined to credit the greater part of the success of the results. Now this intelligent supervision cannot be made available to any great extent. And as regards the careful cultivation, the great question arises, can all this be done on a large scale? and if so, at what cost? and will the cost repay the expenditure and

leave an encouraging margin of profits? It is comparatively easy to tend with great care the plants on, say one acre of ground, but can that same attention and supervision be devoted by a cultivator to the entire extent of his holding?

If not then he must hire labour. Is labour always available? and if so, what will it cost him to farm, say 20 acres in this way? On these points the success of the system I think chiefly depends, and I believe it to be necessary that they should be carefully ascertained before any reliable opinion can be formed as to the prospect of the system being generally adopted by the native cultivator. And this can only be done by experiments being undertaken on a sufficiently large scale, and on a careful record of the expense and results being kept.

It will be remembered that for some time since, the establishment of a model farm in the Ambala District has been under consideration. I have been in communication with the Financial Commissioner of the Punjab on the subject, and I understand from Mr. Egerton that he is in favor of such an undertaking. The subject has been referred to the Commissioner of the Ambala Division, who has evinced much interest in the matter, and I believe the question of a site is now under consideration. I would suggest then that on this farm careful experiments, on the system advocated by Mr. Login, be undertaken in communication with that gentleman, and that every variety of experiment on this system be tried, the plants being sown in the manner recommended by Mr. Login, and grown with and without the assistance of manure and irrigation. Each experiment should be 5 acres in extent, and at least 50 acres should be sown with cotton: the cost of cultivation and the out-turn of the 50 acres being carefully noted.

If this recommendation is approved, I might, perhaps, be permitted to work out the details in consultation with the Commissioner of the Division and Mr. Login himself.

Lastly, I would beg to be permitted to express my opinion that Mr. Login has rendered a great service to the cause of cotton cultivation by undertaking these experiments, and by devoting so much intelligent attention to their carrying out, and I hope that the thanks of the Government of India may be accorded to him for his valuable exertions.

Mr. Login mentioned to me that his overseers, Zulphicar and Chokeeloli, have rendered him great assistance. Both these men accompanied me to the experiments, and it was evident that they had devoted much of their spare time to the subject, and had worked very intelligently and zealously. I think it most desirable to encourage men of this class to take an interest in our endeavours to improve the cultivation of cotton.

I would beg therefore to be permitted to present each of them with a silver watch of the value of Rs. 60 in recognition of their services. If further experiments are undertaken next year, I would feel particularly glad if I could secure the assistance of so intelligent a coadjutor as Zulphicar, the overseer noticed above.

The Planters' Gazette.

BOMBAY, 22ND APRIL 1872.

TEA ESTATES.

It is satisfactory to learn that the prospects of the Tea Planters at Darjeeling this year continue bright. Ten new tea gardens are being opened out this season, and the lands are selling at Rs. 10 per acre, though Rs. 30 per acre has been paid.

Messrs. Thompson's *Tea Circular* of February 15th reports that the quantity of Indian tea on the London market was so great, and such heavy shipments continued to arrive, that only samples of favourite marks, or possessing some decided character, could attract attention. This report, says the *Darjeeling News*, suggests careful consideration as to what the reports of prices are likely to be five years hence, when the out-turn of all the new tea gardens reaches the home markets. However, a very general belief prevails that tea cultivation can scarcely be overdone, but it is just as well, remarks our contemporary, now and then to note the signs indicating a glut of the tea market,—especially the home one, which is the Indian Tea Planters' mainstay at present.

COFFEE ESTATES.

We are glad to see that the leaf disease is rapidly disappearing from South Wynaad, and that the planters themselves are satisfied with their prospects. The *South of India Observer's* correspondent writes:—

"The leaf disease has almost disappeared, and, thank goodness! has'nt done as much harm. If we have rain presently, every estate will be white in 48 hours after the first shower. There is a good deal of opening going on, chiefly in this district (South Wynaad), but some in the North as well; nearly all the openings are by old planters and proprietors, which is a far more healthy sign than if they were mere speculations.

"I don't think the crops this year will be much more than a *good* average: young coffee seems likely to bear heavily, but the old trees didn't seem inclined to distress themselves. Good average crops, at present prices, will pay very nicely, I can assure you: and as stocks seem low at home, and this year's supply is a short one, we hope the prices will keep up to next season too. An average of 74s. for ordinary kinds, and 66s. for triage, allows a *margin* for profit!"

The *Madras Standard* learns from Mercara, that the crop of coffee this year has not been so large as in the two preceding years owing to too much rain. The planters however are making arrangements to plant during the next season and to allow the surplus water to run into proper reservoirs. A good crop is expected next year.

At Shimogah, the coffee crop this season has not been so large as was expected. When the plants were in full bearing, it was thought that the crop would be superior to those of past years, but after the curing, it was found that the supplies were short. In certain parts of the district rain did not fall when it was most required, and the natives attribute the small out-turn to the eclipse of December last. The result of the season is however stated to be not unfavourable.

IPECACUANHA

Five consignments of ipecacuanha plants have arrived from England and been despatched to Sikkim. The less they were looked after on the voyage, the better they seem to have thriven. There is, we understand, every prospect of the ipecacuanha experiment turning out a success.—*Indian Observer.*

CINCHONA.

THE PRICE OF CINCHONA.

The price of the cinchona plants sold last year by the Madras Government, was one anna per plant. On the representations of purchasers and of the Superintendent of the plantations the price has now been reduced to two pies per plant. This would make it appear that the Madras plantations are flourishing.—*Pioneer.*

CINCHONA GROWING.

The report on the Government cinchona plantations on the Neilgherries for 1870-71 is a rather disheartening publication, as it seems to shew that cinchona-growing is after all not likely to be a profitable speculation. In America cinchona bark is a wild product, and its growth costs almost nothing. In India the cost of its production is very heavy. From the quantity of bark brought into the home-market, it appears that the supply from America, instead of decreasing as was anticipated, is yearly becoming more abundant. It is therefore evident that, with the present low quality of bark, the Neilgherries can never hope successfully to compete in the home-market with American bark-like quality, though with a higher quality of bark it is possible that a successful competition might be established. But this cultivation of higher class bark necessitates a higher expenditure; so that we come again to the conclusion that the *expense* of cinchona cultivation in the Neilgherries is fatal to the enterprize. At the same time the fact remains undisputed that with foreign quinine at its present rates it will always pay the Government of India to grow cinchona for the purposes of Indian consumption.—*Pioneer.*

CINCHONA PLANTATIONS.

J. W. BREEKS, Esq., Commissioner of the Nilgiris, has addressed the following letter to the Secretary to Government, Revenue Department, Fort St. George, dated Ootacamund, 9th June 1871.

I have the honour to submit the report on the Government cinchona plantations for 1870-71.

Two acres of the new varieties of *C. Calisaya* were planted during the year, and this was the only extension made. The other planting operations were confined to filling up vacancies, planting the edges of roads and spaces by the side of ravines. 602 plants and 45 ounces of seed were distributed to the public. 51,352 lbs.

of fresh bark were supplied to the Government Quinologist for the manufacture of his "amorphous quinine."

The Superintendent reports that the trees manured with guano, sulphate of ammonia, and stable manure in 1870, have not yet shown any marked improvement in growth.

The Superintendent's calculation of the yield in the eighth year of an acre of cinchona holds out a favourable prospect to cinchona growers on the Nilgiris. There is however much force in his remarks on the length of time the grower has to wait for a return for his outlay—eight or nine years with red barks, and twelve or fourteen with crown barks. This seems to me to tell with great force in favour of the cowle system of land tenure, if Government are desirous to see their waste land taken up for cinchona cultivation. In connection with this I take leave to refer to my letter to the Board dated 26th October 1869.

I need not here discuss the mossing and coppicing processes alluded to in paragraphs 10, 11, 12, 13, and 14 of Mr. McIvor's report. As stated in my letter of the 15th March last, No. 20, the value of mossed as compared with unmossed barks, and the best mode of harvesting the bark are now being tested.

During the year under review Mr. McIvor, with the sanction of Government, paid a visit to the Bengal plantations, and has submitted an interesting report on their condition. I would suggest here that he be permitted in like manner to pay a visit to the Java plantations at a time of year when his services can be spared, in order to make himself acquainted with the system of cinchona cultivation in force and the result obtained there.

I have visited the various Nilgiri plantations several times in the year under report, and am well-pleased with all I have seen, except at Mailkoondah, regarding which plantation the Government are in possession of my opinion. I regret that Mr. Dawson has left the department; his practical knowledge of the state of our plantations and of the various experiments that were being carried on, rendered his services of especial value in the absence of Mr. McIvor.

In the course of a month or so, I hope to be able to submit to Government detailed survey plans of all the Government cinchona estates.

REPORT ON THE GOVERNMENT CINCHONA PLANTATIONS, OOTACAMUND, NILGIRIS, FOR THE OFFICIAL YEAR 1870-71.

THE growth of the cinchona plants during the past year has been very satisfactory. The older plants of the different varieties of *Cinchona officinalis* have formed fine leading shoots, and entirely thrown off the shrubby habit, and assumed a tree-like appearance. The largest plants of *C. officinalis* vary from 22 to 28 feet in height, with a circumference of stem of from 18 to 21 inches. The finest plants of *C. Succirubra* are now 30 feet high, with a circumference of stem of 3 feet.

Three thousand five hundred plants of the new varieties of *C. Calisaya* have been permanently planted out on new land. These have been planted close, and will cover about two acres of land. This is the only extension made to our permanent plantations, our operations having been confined to filling up failures, planting along the edges of the roads and spaces by the sides of ravines.

The number of plants of the new species propagated during the year is 16,379 against 17,000, the result of last year's propagation. Only 6[illegible] plants have been distributed to the public, and 45 ounces of seed have been gratuitously issued to planters in various parts of India.

Among the new species recently introduced, some of the varieties of Pitayo bark promise to be hardy and well-suited to this climate. The total number of plants of new and recently introduced varieties are as follow :—

Cinchona lancifolia (from Java)	279
" *officinalis* (lanceolate-leaved variety)	2,140
" *Pitayensis*	1,779
" *Calisaya* new varieties	51,881
	56,079

The new varieties of *C. Calisaya* having been sufficiently propagated to meet the extensions desired by Government, the propagation of these sorts has been discontinued. The imported plants of *C. Pitayensis*, received on the 9th December 1870, are being increased, as this imported variety is stated by Mr. Cross, to be of very great value, and it may differ in quality from the seedlings raised from the imported seeds; it is therefore considered desirable to continue the propagation of this kind. The *C. Lancifolia*, received from Java, makes slow growth in this climate, and consequently has not been extensively propagated. There are in all seven varieties of the lanceolate-leaved *Cinchona Officinalis*. These differ slightly in appearance one from another, and also in the quality of bark. Nos. 1 to 3 having been found to yield the greatest quantity of quinine, these numbers only are now propagated.

During the year 51,553 lbs. of fresh bark has been supplied to Mr. Broughton, the Government Quinologist, for the manufacture of amorphous quinine.

The cinchona trees which were manured in 1870 with guano, sulphate of ammonia, and stable manure, do not show any marked [illegible] little or no effect [illegible]

[illegible] when supplied as a [illegible] that from 1,000 [illegible] 1,000 lbs. weight of [illegible] yields in October and November of this year [illegible] bark; in all 2,000 lbs. during the year [illegible] of bark per tree. This bark will realize [illegible] 2s. 6d. to 3s. per lb., from which, deducting [illegible] collection, carriage, &c., and calculating [illegible] a clear profit of at least Rs. 1 per lb., or Rs. [illegible] remain. Supposing the cost of cinchona cultivation [illegible] year to be Rs. 1,000 per acre, the above return will make [illegible] cultivation a very good investment, specially as the yield in the ninth year will be almost equal in value to that obtained in the eighth. In the tenth and each succeeding year the yield will, in all probability, increase with the growth of the trees and in consequence of the quality of the bark improving with each renewal. I make the above observations, as at the present moment there is a strong conviction that cinchona cultivation will not prove profitable. This conviction has caused private individuals who have invested in the cultivation as a speculation, to withhold expenditure; consequently, private estates on the Nilgiris are generally in a neglected or abandoned condition.

The above yield of bark is higher than could be expected from the average of private plantations in the eighth year. Such plantations would probably not yield more than half the quantity of bark given above, as the trees from which this bark was taken were planted in October 1862 on the Government plantations, and from the first were well cared for. The land was thoroughly prepared and trenched before the plants were placed in it, and from that time to the present date the plants had every attention and care; consequently their growth has been much above the average development of trees on private plantations, where a smaller expenditure of money and care has been considered sufficient.

There exists, however, serious difficulties to be encountered by speculators in cinchona cultivation. With red bark it is necessary to wait eight to nine years, and with crown bark twelve to fourteen years, before a profitable crop can be obtained. It is few who can be so long out of their money, and at the same time maintain an expensive cultivation. Apart from this, it is difficult to enter into successful competition with American grown bark. In America cinchona bark is a wild product, and its growth costs nothing. Here, in India, as a cultivated plant, the cost of production forms the heaviest item of charge. From the quantity of bark brought into the home market, it appears that the supply from America, instead of decreasing as was anticipated, is yearly becoming more abundant, so that the supply from this source keeps pace with the increasing demand. It is therefore evident that, with a low quality of bark, we can never hope successfully to compete in the home market with American bark of like quality; but with higher quality barks I believe that a successful and profitable competition can be established. The mossing process is indispensable to obtain a bark of high quality, as by each successive renewal of bark its value increases; and this will no doubt continue until red bark will yield from 10 to 12 per cent. of crystallizable alkaloid, and of this from 6 to 8 per cent. of quinine sufficiently pure to pass the commercial [illegible]. From crown barks a like quantity of crystallizable alkaloids will probably be procured, of which from 8 to 10 per cent. will be commercial quinine. Bark of this quality would defy competition, as no such bark could be procured from America. The freedom with which these high qualities of bark are [illegible] greatly enhances their value, while the cost of collection, [illegible] and shipment, would be the same as for an inferior [illegible]. It appears therefore to be an object of importance to aim at producing only the highest quality of bark.

The bark from loppings and the prunings, such as we have during last year supplied to Mr. Broughton for the manufacture of amorphous quinine, if sent into the home market would scarcely pay the cost of collection and carriage. The coppicing system has the disadvantage of always producing a bark of ordinary quality, and only giving a crop every eighth year.

In Mr. Broughton's letter of the 21st August 1871, [illegible] in Proceedings of Government of the 7th February [illegible] man estimates the yield of an unmossed [illegible] to contain 7·95 per cent. of [illegible] cent. in the branch bark. [illegible] Mr. Broughton does not say how [illegible] much is quinine. When the [illegible] be important, although it is not [illegible] 'amorphous quinine.' In [illegible] I assume that after a tree [illegible] the shoots, after a lapse of [illegible] as the original tree—an [illegible]

[illegible]

[illegible] Government [illegible]

TEA.

THE CULTIVATION.

[illegible] "It is a very generally prevalent belief that our cultivation has scarcely to overtake, and that there will always be a ready demand for the rapidly increasing crops. Within certain limits this may be [illegible] enough, but it is just as well to note now and then the signs indicating a glut of the tea market,—especially the home market which is the Indian Tea Planter's mainway at present. As lately as a month ago we saw that the quantity of Indian tea in the London market was so great, and such heavy shipments continued to arrive, that only samples of favorite marks or possessing some distinct character, could attract attention. This is the Mecca. Thomson's tea report of the 15th ultimo, and it already suggests careful consideration as to what the reports of prices are likely to be, say five years hence, when the outturn of all the new tea gardens now springing up on every available rainfall throughout India. But there is one other suggestion involved, and that is early attention to the opening up of a market for the tea in this part of the world."

Our fellow journalist may say of us as a certain great lexicographer said to an opponent "I can give you arguments, Sir, but I cannot give you brains." So be it; we will endeavour to find consolation under even so great a trial, but let our Darjeeling contemporary lay the flattering unction to his soul that, arguments or brains, we care not which, we will agree to be satisfied with both or either. Our wants are extremely moderate.—*Bengal Times.*

THE PROSPECTS.

Since the abnormal depression caused by the crisis of 1866, the steady upward tendency of tea as a subject of increasing imperial, as well as of commercial interest, has raised its prospects to an importance which demands careful and frequent attending to maintain its character as a recuperative agricultural speculation. To point out how the tea interest may be promoted as a subject of imperial legislation, it may perhaps be as well to show how its out-turn and exportation have increased within the last few years, and afterwards to suggest such remedies as will help to regulate the remuneration of coolies and instil a new element of health into the labour market. The following figures are worth studying. In eleven months, between 1866-67, the value of our tea exportation amounted to 50 lakhs of rupees; in 1870-71 it rose to 112 lakhs. Between 1867-68 there were exported in round numbers 7,811,000 lbs.; in 1868-69 the quantity exported amounted to eleven-and-a-half millions of pounds. In the year following, 1869-70 the sum total aggregated one-and-a-quarter million in excess, or twelve and three-quarters millions of pounds, and in the subsequent year 1870-71, it had risen to thirteen and one-quarter millions. In the first seven months of the current financial year, according to the *Indian Observer*, the exports have amounted to 7,814,07[illegible] lbs., as compared with 6,346,[illegible] lbs. during the same period of 1870-71, showing an increase [illegible] 23 per cent. The total exports during 1871-72 are reckoned at very little short of sixteen millions of pounds, valued at about one-and-a-third million sterling. At the end of last December there were in the Calcutta register thirty-five tea companies, showing a nominal capital of 166 lakhs of rupees, most of which may be regarded as healthy undertakings financially considered, but the number represents only the tail of the aggregate of tea companies incorporated in Calcutta and elsewhere at different times, a good many of which have been brought into liquidation. It [illegible] to consider how many tea companies are registered in England, and to [illegible] the rapid growth of private enterprise in [illegible] 166 lakhs, by no means represents the entire capital employed, which our contemporary [illegible] at about four millions sterling, [illegible] of this figure by the following calculation. [illegible] lbs. or [illegible] maunds. [illegible] the average [illegible] all [illegible] the [illegible] will stand at [illegible] invested in tea; and to [illegible] these gigantic operations we have, according to the late census, 370 British-born planters in the province, while

the indigo planters number only 342. Our contemporary continues:—

"Now let us pause for a moment to weigh the full significance of these figures. Here we have a comparatively new branch of industry, introduced by British enterprise and carried on by British capital, already bringing into the country year by year (even if we deduct a profit of 5 per cent. on the capital sunk, which on an average tea does not yet pay) upwards of a million sterling; a branch of industry, again, which has not extended itself by ousting the food staples of the land, but which, on the contrary, has sought the wastes and hills, and created new fields for the labour of the teeming masses of India. Nor is it to India alone that the extension of tea cultivation has proved profitable. Within a very small fraction, all the tea grown in India goes to England, and the English duty upon the Indian tea exported during the past season, will amount to no less than £400,000; while the people are provided with a wholesome and superior beverage in place of the flavourless and noxious mixtures imported from China.

We have said above that the tea interest has lately shown signs of recovering in the market the position which it lost during the crisis of 1866. This has been particularly the case during the year which has just closed. Shares which at the beginning of 1870 were selling for a mere song, are now quoted above par. Assams, which were then at par are now at 75 premium. Bisnauths, which were at 50 discount, are now at 35 premium, Eastern Cachars were at Rs 90, and are now at Rs 125. Soons and Tuckvars have risen from Rs 35 to over Rs. 100. And a similar rise has taken place in the shares of other companies. It is of considerable importance then to inquire into the causes of this sudden increase in the market value of tea property. Is the rise bona fide and likely to be maintained, or is it the result of speculation which must give way to a reaction by and-bye?"

The *Observer*, besides doubting the healthiness of this rapid rise, offers some exceedingly sage and pertinent remarks on the extremely fluctuating value of tea shares, remarks which may tend to check many an unwary capitalist, from rushing headlong into an enterprise which is undertaken even by the most experienced with cautious deliberation. Last year, says the writer—one evidently familiar with his subject—tea shares were unduly depressed. Many companies only just turned the corner in 1870, and paid their first dividend upon the crop of that year, but these same companies, with larger out-turn of produce and improved cultivation may fairly be expected to yield higher profits in future years, and he points to the operations of last year as illustrative of his argument, reminding us however that the season 1871 was unusually favourable in the Darjeeling district, and consequently quite exceptional in its results. But this is saying very little more than that, with an increase of quantity we may expect a corresponding increase in value. It is not we presume a very difficult sum in mental arithmetic to find the difference in value between five or six hundred pounds of tea, say at two shillings per pound, though this is just what the *Observer* endeavours to demonstrate. But leaving aside this point and returning to our remarks on the fluctuation in the value of tea shares, we find our contemporary perfectly correct in his position as to the sensitiveness of Calcutta Share Market, and the extraordinary effect a forced sale will sometimes have in running shares up to a fabulous value. A single bad season will as certainly have a largely depressing influence, as a good one will have the reverse, and it is frequently owing to this extreme sensitiveness that shares have changed hands with a rapidity that leaves no time for rational calculation on future prospects. In the words of the *Observer*:—

"There is nothing more extraordinary than the extent to which the failure to pay a dividend even for a single half-year will depress even the best stock in India. People investing in Joint Stock Companies in this country expect to get at least ten per cent, and they expect to get it with tolerable certainty. If the dividend is not forthcoming, they at once lose faith in the concern, and the consequence is a fall in the price of shares often far beyond any reasonable explanation. So it is with tea. As long as a company pays 10 or 12 per cent, its shares may be expected to remain at par; and with larger dividends to rise in proportion. But let a bad season come (and there are bad seasons for tea as well as for indigo), and the shares will drop; and the investor, who has to sell out then, will probably find himself a loser."

On the whole, we may safely calculate that the future of tea is hopeful, and has never been more steadily promising than now. We should not, however, forget that its manufacture in this country can never be reduced to anything like the comparatively trifling cost it involves in China, while without a corresponding reduction in the English duty on Indian teas, our increasing exportation must burden the London market and depress prices to an almost unremunerative scale, or become an unsaleable drug, except to dealers for flavouring purposes. Of late the China manufactured plant has lost ground with as much rapidity as our Indian teas have found acceptance with the British public, but we cannot expect that the favourable rates which now prevail will long be maintained, when our exportations assume as they have done of late years an irresistible expansion. And, as according to the immutable laws of supply and demand, prices fall as supplies multiply, some counteraction must be applied to keep rates up to a remunerative minimum standard, we would suggest, as we did three years ago, the establishment of a general Tea Agency in London, where none but the best teas of Indian growth might be had at prices which should never fall below a certain value. In this way the best companies out here, co-operating with proprietors of extensive estates, might depend upon ready and profitable sales, if not of all, at least of the bulk of their tea output. [illegible] in the [illegible] cultivation or combine their [illegible] lation nearer home, where spirit, [illegible] of capital, would probably secure for [illegible] would tax all their skill and ingenuity to [illegible] conflict of interests would be cut, [illegible] a spasmodic, cadaverous competition which [illegible] of capitalists without imparting a healthy stimulus to [illegible] enterprise. When this condition of things [illegible] means of cultivation begin to render employers [illegible] pendent of their labourers, and prove their [illegible] conditions, where yet they are but little better than [illegible] may mark a new era in the history of Indian tea [illegible], which will render this branch of agricultural industry [illegible] than ever a centre of attraction to the capitalist and the statesman. But alluding to legislation reminds us that much remains to be said on the labour question, which we could not attempt to begin without far exceeding the limits of an editorial article. It will give us decided pleasure to take up the second part of our subject on the first convenient opportunity that may present itself.—*Bengal Times.*

COFFEE.

A correspondent writing from Calicut states:—"Business here now is at its height, but I fear all will soon be over, as the crops in Wynaad have fallen far short of the estimates, and nearly all the estates have sent off the coffee they had. It is, however a consolation to the planters that such high prices are ruling for the article. I wonder if coffee ever was so dear on this coast, and it is doubtful whether the prices at present ruling in England warrant the exorbitant rates demanded and paid for the article here. Native coffee is at the present moment not procurable under Rs. 31-8 per cwt. F. O. B. The last quotation in the London market for the article was 71 shillings. Freight, insurance, and other London charges will be equally to full 10 shillings per cwt. which will net say 61 shillings or £ shillings per cwt. less what is paid for it here.' We are inclined to think that this correspondent is misinformed, as we have received and continue to receive favourable reports of the coffee crops of the present season. Large quantities are being still shipped from the ports of the Malabar Coast, and a great deal is coming down to Cochin for ultimate shipment to England. A certain native ship-owner at this place has two or three of his vessels plying constantly between Cochin and the ports to the north, for the purpose of bringing down coffee. We think that the state of the English market induces heavy shipment of coffee, and the chances are that the investments of this season on the article would turn profitable.—*Cochin Argus*

CAUTION TO PLANTERS.

We are informed upon what we fear is a reliable authority, that a sad accident involving the destruction of some forty acres of coffee, has occurred in Travancore. It seems that the weeds upon this estate were permitted to lie upon the surface of the ground amongst the coffee in great profusion, which the extreme dry weather converted into a highly inflammable mass, by some accident the refuse caught fire, and caused the [illegible] we describe.—*South of India Observer*

DEODORISING PROPERTIES OF COFFEE.

It will perhaps be useful to know that after numerous experiments with roasted coffee the result proves that it is one of the most powerful means, not only of rendering animal and vegetable effluvia innocuous, but actually destroying them. A room in which meat in an advanced degree of decomposition had been kept for some time, was instantly deprived of all smell, on an open coffee roaster being carried through it containing a pound of coffee newly roasted. In another room exposed the effluvium occasioned by the clearing out of a cesspool, so that sulphuretted hydrogen and ammonia could be chemically detected, the stench was completely removed within half a minute on the employment of three ounces of fresh coffee. The best mode of using it as a disinfectant is to dry the raw bean, pound it in a mortar and then roast the powder in a moderately heated iron plate until it assumes a dark brown hue, when it is ready for use. This is really worth remembering.—*Poona Observer.*

THE ACTION OF COFFEE ON THE HUMAN SYSTEM.

Dr. Julius Lehmann gives the following as the results of his experiments upon the action of coffee on the animal system:—The use of a decoction of coffee [illegible] the body which are very difficult to [illegible] of the food to take place slower, and produces a [illegible] of the nervous and circulating systems. It enlivens the activity of the mind, a general feeling of well-being and elevation of spirits

[illegible]

[illegible] *Observer.*

[illegible]

Sir,—Since my letter of January the 3rd, the fractional letters that you have published have shown how very general this pest is spread over the coffee estates. The microscopic examinations made by Mr. Thwaites appear to prove that the coffee-leaf suffers from *a disease peculiar to itself*, and from the statement of "One Interested in Coffee," in your number of the 12th instant, I fear it may be rather deep-seated. The heart of the branches being affected does not promise that the pest may be so transient as many of your correspondents have appeared to hope. I do not question Mr. Thwaites' authority when he states that the coffee-leaf has its own *special form of the disease*. I would suggest that the fact of the *leaf-disease being general* at present on large trees, shrubs, and even watercress, deserves the attention of scientific men, and as isolated and often apparently insignificant facts prove of great value in scientific investigations, I was surprised to observe something like a sneer at unprofessional reports in spite of the scientific opinions that you quoted. I have been a Ceylon since 1844, and have felt pleased at observing the number of respectable writers that we have amongst the coffee planters of Ceylon, as I have judged by the *Observer's* contributors. Begging a corner of your valuable space. I am, &c.,

SEA AND LAND.

ARTIFICIAL MANURES.

A CORRESPONDENT from whom we are always glad to hear, writes as follows:—"You insist much upon railways keeping up the fertility of soils. Now to my mind, the manures they carry act like the quicksilver that is sent in search of gold. To render land permanently fertile, the tilth should be preserved and deepened, and such matter restored as shall render soluble what Dr. Voelcker calls insoluble. That is the planter's real bank of fertility. It is in deposit account, and his object should be to transfer it to drawing account. Fruit-forcing manures are just checks upon the latter. The artificial milk you noticed is a poor substitute for the real thing, no phosphorus for the bones, the brain, and nerves, no chlorine and iron for the blood—poor mill-fed calves it would make? And so with artificial manures—better let the problem be—how to make the most of what nature herself has supplied." The perfection of manuring we take to be the addition to soil and humus of fertilising salts, &c. Bones, soda, &c., we can only get from abroad, and poonac, though a local product, must go from the seaboard to the interior. For such reasons as these, we want facile and cheap means of communication.—*Ceylon Observer.*

A "BURN" ON A COFFEE ESTATE.

A [illegible] Planter thus vividly describes the burning of felled forest adjoining cultivated coffee land:—"Yesterday, however, as there was a strong wind blowing, the Pariya Dorre (I am the Sinhalese [illegible]) determined to have a burn: that is after felling the forest and leaving it lie for a month or so to dry, the whole is set on fire to clear and fertilise the land. Well, after breakfast, Mr.— and I went down to the scene of action with two boxes of Bryant and May's only-on-the-top matches, accompanied by several canganies and all the coolies. The edges of the doomed circle were lighted first, so that the last and fiercest of the fire should be exposed to the centre of a waste of ashes. Gradually the flames spread and leaping about fifty 40 feet into the air made the rocks and [illegible] with a thundering roar. Smoke began to roll [illegible] to add to the horror of the situation, the [illegible] spread over the face of the earth in which the coffee, [illegible] to expose to each other. Soon other work than coo-eeing was their lot, for fire-brands began to drop among the coffee, setting alight the rotten old [illegible] that are left to fertilise the soil by their decomposition. [illegible] the general standing on a hill [illegible] the trouble [illegible] to be my charge. (Mr. [illegible]) [illegible] in different situations, [illegible] Bible puff of smoke [illegible] and [illegible] a rush of [illegible] with [illegible] the fire in earth. But [illegible] the fire got through the small belt that had been left to protect the coffee. The old [illegible] and in alarm and despair we had [illegible] that we should be buried in the fall. I was almost blinded and suffocated by the smoke, but we stuck at our posts till the fire was overcome."—*Ceylon Observer.*

COFFEE PRODUCTION IN BRAZIL.

THE *Public Ledger* contains a review of the Rio coffee trade for 1871, which we shall copy into our issue of Saturday. The writer while stating that the general opinion is that slave emancipation will favourably affect agriculture, yet expresses the conviction that temporary embarrassment will occur, "which without the active support of the planters and the earnest co-operation of the Government, may even assume a serious character." It is believed that, what with new coffee and old, the shipments from Rio from 1st July 1871 to 30th June 1872 will be 2,000,000 bags. Add say 450,000 bags for Santos, and we get a total of 2,450,000 bags or about cwts. 3,600,000. Should this be about the result, the exports of the three great coffee countries of the world for season 1871-72 (to 30th September in Ceylon; 30th June in Brazil and Java); may be taken at,—

Brazil	cwts.	3,600,000
Java (about)	"	1,[illegible],000
Ceylon "	"	7[illegible],000
Total	cwts.	5,[illegible],000

The consumption of the United States alone being now up to cwts. 4,000,000, or [illegible],000 more than Brazil is expected to produce, it seems clear enough that ere many months elapse, Java and Ceylon will be rid of their most formidable competitor in the markets of Europe. In the article we refer to an estimate of 180,000 bags per month as the consumption of the United States is taken, but we believe the estimate might be nearly doubled. We have certainly seen the consumption estimated at 200,000 tons per annum, and we believe it is now not far below that figure.

From a table attached to the "review" to which we have alluded, we get information respecting the exports of coffee for the seasons ending 30th June 1869, 1870, and 1871, from both Rio and Santos. Adding the figures together and roughly converting bags into cwts., we get the following results:—

EXPORTS OF COFFEE FROM BRAZIL.

1869	cwts.	4,[illegible],000
1870	"	5,600,000
1871	"	4,360,000

The average export of Brazil therefore for the past three seasons, has been little short of five millions of cwts., about a million in excess of the united exports of Java, Ceylon, and Continental India. Taking these countries at the round three millions, we doubt if South America, Arabia, &c., will give much more than the additional million for export. So that Brazil, has for the past three years, besides supplying local demand, *exported* as much as all other coffee countries in the aggregate. That the average export from Brazil will be decreased by at least one million of cwts., seems a reasonable supposition, but even if the export of four millions is kept up, it seems to us that with the advancing consumption of the United States and the Continent of Europe, we are safe to produce as rapidly and plentifully as we can in Ceylon.

Taking local consumption into account (much higher in most producing countries than it is in Ceylon), we think our estimates of 12 or 13 millions of cwts., as the total production of coffee in the world, is not far wide of the truth. The prospect certainly is that for some years to come the supply will fall short of the increasing demand.—*Ceylon Observer.*

MANURING, &c.

(*Ceylon Times.*)

DEAR SIR,—I am very glad to see the question of manuring cropping up in the papers again. Discussion is much wanted, for I think there cannot be much doubt that short crops on many Estates are attributable to the *injudicious* use of stimulating manures in Homœopathic doses. You know the opinion which I have long held on the subject and further experience show that I was right: you can no more keep an old tree in good health by *oz.* doses of *any* manure, than you can keep a man healthy (or even alive) on a tea spoonfull of Leibeg's "Extractum Carnis"—both must have *quantity*; a breakfast full of cow-dung or good *compost* for the one, and a beef-steak for the other! and so must we manure in future if we want crops, and who does not? Yours, &c.,

January 11th, 1872. RAINWELLA.

COFFEE PLANTING.

To the Editor of the "Field."

SIR,—With regard to a work on coffee, entering so minutely into detail as "Strathtowen" would wish, I think such a work has still to be published. Dr. Short, sometime of Madras, published

a good work on coffee and its cultivation; but I do not think that in it is all the information that your correspondent "Strathleven" would wish. A copy of the work could be easily got; it was published in Madras in either the year 1865 or '66, at a price of, I think, two or three rupees. That coffee planting is a "speculation at best" I altogether disclaim. Gone into with care and ordinary prudence, as it ought to be, one is sure of ultimate success. There is no more hazard in growing the bean, providing a good soil and suitable situation are found, than there is, say, in growing a crop of roots or any other crop in this country. Given a good piece of land at a proper elevation, a good supply of labour, and with a little capital at one's back, he must be a muff indeed if he cannot make coffee pay—aye, and pay handsomely, too. What has done much to damage coffee growing as a venture in the estimation of the capitalist, was the rush that was made into it (I speak of Western India) in '64, '65, and '66, by Bombay men. Then the cry was "Give us coffee land; open out coffee for us: here is the money, why don't you spend it fast enough? Buy up land, and be quick about it." The consequence was, that large tracts of land were planted with coffee that were never fitted for it. And the very men that were opening out and planting the land know that they could never take the money out of the soil that they were putting in. But their orders were, "Open out, open out; give us coffee; only spend our money fast enough; buy up land, and be quick about it;" and they had nothing for it but to comply. Planters in coffee with a Bombay connection had a grand time of it in '65 and '66; they had the spending of many a bright lac of rupees, and as a consequence, what came lightly went lightly. When times began to wear a less favourable aspect for them, then there was a general desire to realise; everyone was as anxious to sell out as he had been formerly to invest. Money to carry on the work of the estates began to be scarce; coolies had to be paid off, and in some cases parted with without pay; and the general cultivation of the estates neglected. Under such treatment the poor and miserable coffee trees that had been planted out on soil and situations quite unfitted for them had to succumb, and the cultivation of coffee in India received a check that it has not yet altogether recovered. That it will do so, however, and speedily, is my firm opinion; and he will be a lucky man in a year or two who holds, say, 500 acres of pucka jungle; he will then be able to get his own price for his land.

If "Strathleven" intends going into coffee, my advice to him would be to ask and pay for the advice of some practical man, and get from him an estimate of probable expenditure and return for, say, five years; and along with that get a few hints as to the growth of the plant and management of the cooly, upon whose exertions the success of the undertaking must ultimately depend. Treat the cooly with every kindness, but at the same time with firmness; that is the whole secret of managing him. When his work for the day is over, see that he has a comfortable and clean hut to go to; and if he has a little bit of garden ground round his house, give him every encouragement to cultivate a taste for fruits and flowers in it. By so doing, you will get him to become attached to the estate, and to take a personal interest in it and in its prosperity. "A Canarese cooly takes an interest in anything and especially in the estate on which he works!" I think I hear some of the knowing ones say, Yes; with good management such a thing is possible. Improbable as it may seem, I have nevertheless found it to be the case; and I have often heard them in the bázaar or market, holding out of their *dhorin* (master) and for their *tote* (estate), as being the best of their kind to be found in the district.

"Old Planter's" advice of paying India and Ceylon a visit before settling down is not so far amiss, the only objection being the cost of the trip; but the experience gained thereby might be the saving of a good deal afterwards. Ceylon men certainly can bear away the palm for well-kept estates; and I believe, though they have to pay nearly double for their labour that is done in India, still Ceylon men can work their estates as cheaply as any in India. They manage to get their coolies to do more work, and they also have, I think, a better method than we had in India—I mean as regards laying out the work.

As for coffee growing in Natal, I do not know much about that; they may be doing very well there, but they can have no chance against Ceylon or India. They cannot have in Natal either the soil or the labour that is to be met with in Ceylon or the Neilgherries, and until they have they cannot with any chance of success compete against those places. I fancy it will be some time yet before Natal will give a yield of 12 cwt. per acre all over-head.

JUNGLEWALLAH.

PRACTICAL COFFEE PLANTIG.

We reprint a letter that appeared some weeks since in the *Field* newspapers, on coffee planting by "Junglewallah," and are glad to have the opportunity of noticing the remarks of a man who is evidently practical, and writes with a knowledge of his subject.

As to "Junglewallah's" advice to "Strathleven," who think of "going into coffee," the latter part of it is eminently practical. Books may do something for a man who already knows a little about the thing he wishes to [illegible] get the [illegible] kind of undertaking must be [illegible] to man could make a [illegible] in a pamphlet, although [illegible] its mechanism and [illegible] on the subject of coffee [illegible] rank considerably higher than Dr [illegible] we may mention those by Sabonadiere and Hull [illegible] which were practical planters, and consequently [illegible] calculations on small experiments, or make a [illegible] out of mere theories. But we would go further than "Junglewallah," and advise "Strathleven" if he turns his [illegible] coffee, intending to work his own estate, to put himself under a practical man, as assistant, or *chick Doray* for a year, before he takes over the management of his own estate. His time need not be wasted if he is anxious to commence at once, as he can easily get some unemployed planter to open his [illegible] for him during that first year; and the extra cost would be well repaid by freedom from the mistakes that a beginner would probably akem, and by the experience he himself would gain in working under a good planter. He might even, if he had such a neighbour near his land, work his own estate as assistant, paying his instructor a moderate salary to keep him straight, but it would be better for him to take a berth in a plantation with coffee in full bearing, and stick sedulously to that, as if he had to earn his living as a Superintendent. There can be no better school than actual experience.

We quite agree with "Junglewallah" when he says—"That coffee planting is a 'speculation at best' I altogether disclaim, unless indeed we are to name every pursuit that calls for the investment of money, such as farming, trading, and even the liberal professions, a speculation." Judgment, prudence, and the habit of observation are certainly almost essential to success, but in what class of investment, except Government securities perhaps, can they be dispensed with? A man certainly may, in coffee as in other things, rush blindly in, and be too self-sufficient to take advice, and yet make a lucky hit; but it is very unlikely. Careful selection of soil, climate, and the locality, are necessary, and there is no reason why any man should be led astray, now that all the districts are so much opened up (unless he intends trying entirely a new field of operations) as he can always form some opinion of the capabilities of any part of the country, by observing the estates already opened in the neighbourhood. Even here, though he should be assisted by a man of experience, or he might lose the chance of good land from seeing badly worked estates near it, or be induced to think another part *naturally* good from the fine appearance of some neighbouring place, which might perhaps be only just keeping its head above water by the most judicious management, and expensive high cultivation.

The causes to which "Junglewallah" alludes, as having "done much to damage coffee-growing as a venture in the estimation of the capitalist," have been before touched on in these columns, though with rather more reticence than "Junglewallah" considers necessary. We should be very sorry to see another such *rush* into coffee, knowing that it must not only do great harm to the interests of man who have gone into planting, to work and make money out of the ground,—not merely to prey on their fellow creatures as *speculators*, but would also result in great disappointment to many, we might say most, of those who made the rush. There are still proprietors of coffee estates, who bought during the *rush* that "Junglewallah" refers to (in 1865) at a high price, and who would be thankful enough to get back a third of the money they they so sanguinely paid down. Others have lost even the remotest chance of ever seeing back any portion of their invested cash. Still, while we deprecate a rush, we cannot but regret to see how slowly coffee planting is regaining its proper place as an investment, and how little confidence is placed in it by those whom it would pay well to "go in for it." However, high prices of produce and the flourishing condition of the estates, on the whole, will tend greatly to restore confidence. Although the leaf-disease has passed through some of the districts, and left its mark behind, we have had no such frightened howlings from our Indian planters as have occupied a prominent place in the Ceylon papers; indeed, most of the practical men merely grumble a little over it, as an unpleasant nuisance, that causes some temporary loss, and perhaps obliges them to curtail expenditure to some extent; none of them have rushed about, frantically wailing that they were ruined, and now that the thing is gone, and its effects are so quickly passing away, they may fairly congratulate themselves in not having been frightened out of their wits.

In another column, we gave extracts from correspondence which shows that planters themselves—at least—are satisfied with their prospects, and do not [illegible] to despond. We hope to see this go on, till all the fine [illegible] be occupied, not only for coffee,—for it must be remembered that the direct stimulus it gives to native [illegible] for other crops, land which no [illegible] greatly increases the prosperity of the country.—*Ceylon Observer.*

[illegible] average of [illegible] the amount [illegible]

[illegible] of the [illegible] annual imports and trade [illegible] the [illegible] and prospects [illegible] in the [illegible] continues to go on so favorably, [illegible] abolition of the import duty on [illegible] still look forward to a most [illegible] of the world for the fragrant berry, [illegible] that whereas at the close of the [illegible] for 12 months was 48,000 tons, it [illegible] 1871 about 130,000 tons. Stocks of coffee again in [illegible] had on the 1st December last, fallen to 5,000 [illegible] compared to 14,100 at the same period in the previous [illegible] it was then estimated that of the forthcoming crop of [illegible] which is the description mostly taken in the States, [illegible] would be required for American consumption." In [illegible] as we have seen, stocks in all ports have declined from [illegible] tons in 1869, to 79,900 tons in 1871.

The latest commercial advices from New York inform us that "Holders were exceedingly firm, and as there was a fair inquiry for the supply of the interior, where it is known stocks have run low, there was no difficulty in supporting the market and commanding very full prices." Stocks were so concentrated and easily controlled that they can scarcely be said to be on the market at all, and the offerings were consequently quite small, which had induced the free purchases of parcels on the way. There was a fair though rather spasmodic inquiry for home use, and considerable parcels were going into consumption from second hands, while stocks in first hands continued light. Java was very firm, but quiet in change in prices.

Turning from the American market to the source of its chief coffee supply Rio, we find that in July 1871, the yield of the season 1871-72 according to a market report from that capital, was "estimated at about 1,500,000 bags, and the quantity of old coffee remaining in the interior at about 500,000 bags; thus calculating the total export during the export year from the 1st July 1871, to the 30th June 1872, at about 2,000,000 bags. Since then it has become evident that the crop was over-estimated, and will probably not turn out larger than 1,000,000 to 1,200,000 bags at the utmost, while on the other hand the quantity of old coffee remaining on the 30th June last year in the interior, has been under-estimated, and will probably have been nearer 800,000 than 500,000 bags. It is however difficult to prove the correctness of these estimates, and as the total result will be about the same, viz., that we may calculate upon an export of about 2,000,000 bags from the 1st July 1871, to the 30th June 1872." If we add to this quantity the shipments from other small ports, we may call the total two millions and-a-half of bags.

Reviewing the export coffee trade of Rio we find that during the latter half of 1871, there had been shipped 1,129,010 bags of coffee, so that there could not have been in December a larger stock on hand than about 900,000 bags including old coffee, not more than sufficient for the American consumption for six months. The advance in the price of Brazil coffee has been equal to about 50 per cent. on previous rates, and both shippers and growers had found the trade extremely remunerative. The accounts of the crop of 1872-73; were on the whole favourable, but as in our own case it is yet too early to form even the roughest estimate of quantity.

The course of the coffee trade at home was during 1871 chequered by vicissitudes, the result of the war and depression of commercial matters on the continent. "The market opened in January with great activity, exporters purchasing largely in anticipation of a speedy termination of the war, and prices experienced an advance of 3s. to 4s. per cwt., but, after the signing the preliminaries of Peace in February, the demand slackened considerably, the unsettled state of things in France under the Commune, inducing much caution amongst operators, and the whole of the advance realized in January was lost in the ensuing three months. Prices rose in June under the influence of large purchases on French account, in anticipation of an increase in the duty, but a reaction occurred again in July, with the cessation of the demand from that quarter. With August, however, a complete change came over the market; the unfavourable accounts received at that time respecting the growing crops in Brazil, Java, and Ceylon, and the large deliveries for consumption induced by the return to a state of Peace on the Continent, and by the moderate prices ruling in most markets, led the Trade to extend their purchases, and with a growing feeling of confidence in the sound position of this article, large speculative purchases were effected, and prices advanced, gradually and almost uninterruptedly, under the influence of vigorous outdoors and extensive demand, which was further stimulated by the excited state of the American markets during the Autumn months, the advance in prices in New York in October far exceeding that realized in Europe. With continued bad accounts from the three principal growing countries, the year closed with some excitement, and an irregular advance in prices of 2s. to 3s. per cwt. on the better, and 6s. to 12s. on the lower qualities of *Plantation Ceylon*, and of 10s. to 15s. per cwt. on the *Native* description."

Since the commencement of the present year, the home market which opened with sustained firmness, has shown further signs of improvement, Native Ceylon having advanced other two shillings, and this notwithstanding that our exports of this particular quality, to date, exceed those of the same time last year, being cwts. 76,940 against cwts. 40,582. Plantation sorts being cwts. 305,155 against cwts. 317,192. During the present month we shall expect to see a still greater decline in the exports of Plantation sorts, parcels of which are now almost unobtainable in our market.—*Ceylon Times.*

ANNUAL REPORT OF THE RIO COFFEE TRADE.

The past year has been abundant of political and commercial events.

What in general deserves most attention and is of the utmost importance to Brazil and its future, is the abolition of slavery. The Government slave bill passed by the Chamber of Deputies on the 28th of August 1871, and was made law on the 28th of September. According to this bill, all children born in Brazil by slave women, since the 28th September 1871, are free, and every year a certain number of slaves will be freed, so that by the end of this century Brazil will have no more slaves.

It is not our object to enter minutely into what effect this measure may exercise upon the future of the country; for the present this cannot be ascertained, and we restrict ourselves to state, that in general, the opinion is prevailing that the emancipation of slaves will prove of beneficial influence to the agriculture and general development of the country. There is however no doubt that the transmutation of forced to free labour will produce some temporary embarrassment, which, without the active support of the planters and the earnest-cooperation of the Government, may even assume a serious character.

The question attracting now the most attention, is that of immigration. The Government has been considering the causes of the ill-success of former exertions, and the best means of obtaining a better result in future, and now offers wise and liberal support to stimulate private and official enterprise for the introduction of immigrants.

Since the termination of the Paraguayan war the financial state of the country has continued to improve.

A loan for £3,000,000 contracted in London, was subscribed considerably above the amount required, a clear proof that in Europe also good confidence in the country is prevailing.*

The additional duty (war tax) on imports of 40 per cent. and 30 per cent. adopted in the beginning of 1870, and which during 1871 was reduced to respectively 34 per cent. and 25 per cent. has, for the next twelve months, been reduced to respectively 28 per cent. and 21 per cent.

By abundant sugar and cotton crops in the northern provinces and impending good coffee crop in the provinces of Rio de Janeiro and S. Paulo (Santos), the finances of the country must further improve, while the increasing facility of transport from the interior to the seaports, promoted by the special attention paid to the extension and construction of railroads,* will contribute to promote the country's prosperity.

Coffee has during the last year attracted more attention than usually. The gradual advance in price here of 50 to 60 per cent. since June has been beneficial to the planters as well as the dealers, and although the advance has been too rapid to allow the export trade in general to profit by it on a large scale, this year has, for the exporters too, been upon the whole a very lucrative one.

Notwithstanding that the European markets have almost during the whole year ruled below the parity of our market, the continual advance of the article has made nearly all shipments result in profit.

To the United States the January shipments were lucrative while the shipments from February to April partly resulted in severe losses. Since then all shipments have left a handsome and partly even a splendid result, notwithstanding that exporters, when purchasing, were generally obliged to anticipate an advance of prices in the United State's markets.

The wild speculation in the United States in October has in general been prejudicial to the trade, as it produced too rapid and heavy an advance in our market. The advantage of this extraordinary rise will, as usually, almost be accounted with by the planters and dealers.

The general position of the article is certainly extremely healthy, but it is still a question if the last paid extravagant prices, which

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* [illegible] "The consumption of the United States [illegible] 1870-71, is 800,000 more than Brazil is expected to produce [illegible] from the latest New York [illegible] advices, [illegible] the present consumption is only 150,000 bags or cwts. 2,000,000, not estimated but usual. The *Public Ledger* gives our data, but the *Observer* is better informed and believes the figures "might be nearly doubled"!

* Hear! Hear! Ed. C. O.

are about 12 per cent. above the value ruling in consuming countries, will prove remunerative.

Common Channel coffee, equal to the classification of ordinary Rio in the United States, has been paid as high as 8$200, equal to about 74s. per cwt. and 16-1-6c gold per lb. f o b including 5 per cent. commission, 50s. and 5 per cent. freight at 24½d. and 110 per cent. exchange, whilst such quality after the latest advices, was ruling respectively at about 68s. per cwt. in the Channel and 15c to 14½c gold per lb in. New York.

The prices for good first ruled at the beginning of this year at 5$800 to 6$, or f o b including 5 per cent. commission and 45s. and 5 per cent. freight at the exchange of 24d. and 110 per cent. equal to 51s. to 35s. 2d. per cwt., or 11 20c to 11 62c gold per lb. and during the first half year underwent but slight fluctuations, being quoted in the end of June 5$700 to 5$900, or f o b including 5 per cent. commission and 35s. and 5 per cent. freight at the exchange of 25d., and 110 per cent. 52s. 7d. to 54s. 1d. per cwt., and 11 47c to 11 81c gold per lb. From the beginning of this season, 1st of July, the f o b cost of the articles has steadily advanced, good first being quoted in the end of the year 8$000 to 8$800, or f o b including 5 per cent. commission and 50s. and 5 per cent. freight at the exchange of 24½d. and 110 per cent. 77s. 1d. to 78s. 7d. per cwt. and 16 83c to 17 16c gold per lb.

The total export from Rio during 1871, shows in comparison with the preceding year, an increase of about 240,000 bags. To the United States have in 1871 been shipped 1,351,000 bags against 1,350,870 bags in 1870 consequently about the same quantity, while to Europe shipments show an increase of about 200,000 bags upon those of 1870, as per statement below.

As appears from the same statement, the increase in the shipments fall upon the first half-year, the total shipments during the last six months amounting to only about 1,130,000 bags against 1,297,000 bags from the 1st July to the 31st December 1871, consequently to about 160,000 bags less during the last six months of this year than during the same period in 1870.

This decrease in the export falls almost entirely upon the United States, whether in six months, from the 1st July to the 31st December of this year, 700,708 bags were shipped against 843,008 bags during the same period in 1870.

In our report of the 5th July 1871, we estimated the yieldance of the present 1871-72 crop at about 1,500,000 bags, and the quantity of old coffee remaining in the interior at about 500,000 bags, thus calculating the total export during the export year from the 1st July 1871 to the 30th June 1872, at about 2,000,000 bags.

Since then it has however become evident that the present crop has been over-estimated, and will probably not turn out larger than 1,000,000 to 1,200,000 bags at the utmost, while on the other hand the quantity of old coffee remaining on the 30th June last year in the interior has been under-estimated, and will probably have been nearer 800,000 than 500,000 bags. It is however difficult to prove the correctness of these estimates, and as the total result will be about the same, viz., that we may calculate upon an export of about 2,000,000 bags from the 1st July 1871 to the 30th June 1872, we have mentioned this matter only in order to point out again how fictitious all estimates regarding the coffee crops in this country are, how cautiously all reports regarding the same must be received.

Since the 1st July of this year, 1,129,610 bags coffee have been shipped, so that, including to-day's stock of about 160,000 bags, scarcely 900,000 bags remain for shipment. It is true that the full quantity of the crop is never shipped up to the end of June, but on the other hand new serra abaixo coffee generally begins to arrive at the market in May already.

The quantity remaining for shipment during this crop year is consequently so small, that it scarcely surpasses the requirements of the United States alone, if the estimates of that country's consumption, say about 130,000 bags per month, prove correct.

Regarding the next 1872-73 crop, the reports from nearly all districts agree, that it promises a satisfactory result; it is, however, too early to form even an approximate opinion of the extent of its ultimate yield.

Shipments of Coffee from Rio de Janeiro from January 1 to December 31.

	1871	1870	1869
North of Europe	693,376	470,004	960,432
Mediterranean	300,443	210,885	331,566
Europe	941,719	681,889	1,107,998
United States	1,351,009	1,350,870	1,253,302
Cape of Good Hope and Sundries	60,885	75,701	61,953
Total	2,353,703	2,107,630	2,513,595

Shipments of Coffee from Santos from January 1 to December 31.

	1871	1870	1869
North of Europe abt	314,580	273,191	419,198
Mediterranean	61,391	43,459	34,159
Europe	375,971	317,570	451,357
United States	85,424	82,891	36,556
Total	460,695	400,461	487,913

BRANCH OF LEAF DISEASE AND SHORT CROP.

(Ceylon Observer.)

We kept our eyes open for both during a recent "tour in the country," extending from Monday the 12th to Saturday the 17th instant, and embracing rather a wide section of the coffee district. Leaf disease we heard of and leaves with the true sooty-looking spots indicating the existence of the peculiar minute fungus were found for us, when we made anxious enquiries. Leaf disease had been very bad in many places, so we were told, and an instance was adduced of a property somewhere in the Hunnasgeria district which the fungus had denuded of every leaf, but with the consolatory qualification that the bared branches had been again clothed with a fresh coating of vegetation, and that never before had the property looked better. The most impressing sight we saw in our journey was presented by the higher portions we passed through of a well-known large estate in Pussellawa. We were told that it had been severely tried, first with leaf disease and then with wind, besides that during the dry weather of February, when crop and heat have told on vigour and vegetation is the time to see at their worst not only coffee estates, but the very jungles and grass lands. No more unpropitious season could be chosen to impress a stranger with a true idea of what our mountain scenery is, and yet it would have been worth a good deal to a lover of the sublime and beautiful to take a journey from the ends of the earth to contemplate with awe the volcano-like effects of the felled forest burnings which covered the mountains with flame and the valleys with smoke, from Haxava in Doloshagie to "the Agras" and "the Gorge" in Dimboola, and to feast the delighted eye on the snowy showers of jasminelike blossoms under which the coffee bushes, especially the tall unpruned native trees, bent gracefully as if proud of their burden.

It would be difficult to exaggerate the rich beauty of emerald green and ermine white which clothed the banks above the road between Peradenia and Gampola, as we saw it on Saturday last. And yet we had just seen something like, but yet unlike the scene, around Mr. MacLeod's bungalow at Kadienlena, and Mr Bissett's airy abode on old Kataboola. The stiff, stately, robust old trees did not in these cases bend under their weight of bloom, but they could scarcely shew a bit of green leaf, or grey stem to diversify the sheet of snowy white which seemed to have fallen on them from heaven, and from which exhaled an odour almost oppressively sweet, suggesting honey scented with jasmine. We abstracted two small branches with undeveloped bloom from one of Mr. Bissett's trees, and it was a sight to see the mountain born blossoms "begin to ope their eyes" in the unaccustomed sea air of Colombo. Blossom quite equal to what we saw on favourite fields of coffee in Kotmalie, we heard of, and partially saw, over whole properties in other places. We just missed seeing the blossom out on Mr. St. George Carey's fine properties in Nilambe. The incipient blossom was there in such quantity and in such a state of forwardness, that on Tuesday morning the 13th, the Proprietor ordered pruning and handling to be stopped next day as he felt certain the blossom would be developed on Thursday. We could almost see the petals moving in their progress to expansion. We turned aside to revisit Nilambe, by special arrangement, that we might satisfy ourselves of the permanent effects of careful cultivation, and thorough but judicious manuring. The season before last Mr. Carey was rewarded for what he had put into the soil by receiving out of it at the average rate of 13 cwts. an acre. The crucial test was in this sad season just ended, when, from a failure most unexpected of the great April blossom to set, so many estates had only "a beggarly account of empty boxes." The owner of the group of Nalambe properties was out in his estimates, like his neighbours; he thought the April blossom had set, and so miscalculated. Nay more, an old Kanghany who had never gone wrong before was out as much as his master. It was all the fault of the "Kirana,"—the Eclipse said the old man, and who knows but the Eclipse had something to do with the abnormal weather? In any case Mr. Carey gathered 5 cwts. per acre in the bad season, laughed at leaf disease, made light of wind, from which on some ridges he lost more leaves than from the fungus, and is confident of a crop this season of 15 cwts. an acre. If he only gathers 13, let our arithmetical readers calculate the average of the three years, as the results of high cultivation. True that Pittawelaya, Le Vallon, and Alice Halt are not old estates, but there is a difference of nearly 1,000 feet between the bottom and the top of Pittawelaya. To the top part, about nine years in coffee, no manure has yet been applied—the soil and climate seem to be sufficient. At the bottom an overdose of bones (*alone*, without pulp or cow manure) nearly "snuffed out" a number of trees, by making them over-bear. Mr. Carey had lessons to learn, like everybody else, and he now knows that on low bat lands, humus and moisture are indispensable. He acts on his experience, and is successful, even to the remunitation of large portions of old Galloway. Kadienlena. We left Nilambe on Tuesday morning on route for Dimboola via Pussellawa, Rambodde and Newera Ellia, with the understanding that we should be enabled to let our readers know how the expected blossom came out, and what our host's opinion of "next year" was. Here is his sum-

* Some of the lower portions looked splendid.

[illegible] we [illegible] showing that we [illegible] the [illegible] of [illegible] into [illegible]

LeVallon, Pussellawa, 17th Feby.

[illegible] are in two [illegible] blossom, I am glad [illegible] and the bole of the bottom part of those [illegible] covered with a [illegible] of more. This is the fifth [illegible] prospects for next season are very [illegible] as we have the two best months for blossoming [illegible] to the 15th April. The weather is most seasonable [illegible] I believe every twig will bear. I can[illegible] fatigue to write those letters, pre[illegible] crop for the Island. As far as I can judge, [illegible] to most of the districts, I certainly think we shall [illegible] average crop, much over the million cwts. I never saw the Kadugannawa Estates, or the native coffee round Kandy [illegible] a splendid blossom on. I am sure you must have noticed it as going down."

That we certainly did, such blossom as neither we nor any of our planting friends had ever seen excelled in the month of February before.

If it be said that the group of properties referred to are still comparatively young, we would point to Rothschild, a considerable portion of which is now between twenty-five and thirty years old. From the time the Messrs. Worms commenced operations on it, they spared no expense in manuring it, and we recollect hearing it said that in one year a sum of £10,000 was expended on 1,000 acres in cultivation. We had the assurance of the Messrs. Worms that the results in yearly returns were in proportion, and when, at the end of a quarter of a century they sold the property, it was as vigorous and fruitful as ever, and they consequently sold at a sum which they considered profitable. Rothschild, an old estate, never neglected, is a specimen of what coffee property in Ceylon would be, had bad times never come to lead to imperfect or no cultivation, to weediness and to partial or thorough abandonment. Portions of Scalpa, on the other hand, one of the first properties opened in Upper Dimbools, and for many years wholly or almost entirely abandoned to goat weed and fern, are proofs of what can be done in resuscitation when there are trees and soil to work upon. In the deep rich soil just under a spur of the magnificent Great Western, Mr. Porter can point to as fine trees with as rich a show of blossom as could be desired, all redeemed from a wilderness of weeds and "brackens." Of course the attempt to resuscitate weedy, old and "shuck" estates, can be attended with fair prospects of success only where there is good soil at least. Examples in Kornegalle seem to prove that even the richest soil will not secure success in the climate is distinguished by too much sun and too little rain. That is, if the popular mode of cultivation is pursued, of felling and burning off every forest tree and jungle bush. Mr. Carey, we understand, means to give a fair trial to the opposite system in some forest land which has passed into his hands in Kornegalle district. The low, bushy jungle alone will be cut down and lopped, but not subjected to the action of fire, while the large trees will be left standing as shades from the fierce rays of the sun and shelters from the withering blasts of wind. The present state of that portion of Hopewell, near Kandy, cultivated on this principle, certainly offers every encouragement, being covered with a marvellous show of blossom, equal, we have been assured by a good authority, to 12 cwt. an acre of clean coffee. But, in truth, this year's February blossom over a large portion of the hill-country of Ceylon, is almost, if not wholly, unprecedented in its beauty and abundance, leading to the fair prospect of compensation in larger crops than usual in most cases for the miserably deficient and disappointing returns of the season just closed. So may it be. We heard but one universal cry of astonishment respecting the statements, and much questioning of the *bona fides*, of the despairing correspondent, who in a late *Observer* professed to lament the disappearance to return no more of the cold mornings and dry hot days which distinguished February in former years. At Nilambe we were shewn furniture which had separated at the joints and curled up, and ivory ornaments which had cracked from the influence of dry, evaporating winds, while in Dimbools the cold had reached the verge of frost! On the Lindoola patenas, a thermometer in the shade had marked 38°, and on the Agras the temperature was reported to have sunk so low as 32°! We were shewn some plants in nurseries near patenas at "the Gorge" the leaves of which had been blackened, while a nursery in the depth of the forest had escaped scathless. The owner of the blackened plants gave orders to lop them, a proceeding which an older resident in the district told us was quite unnecessary. He said if the plants were let alone the leaves would drop off, be replaced by fresh vegetation, and the plants be none the worse. The slight tendency to occasional checks from frost or rather frostiness is considered rather favourable than otherwise by dwellers near "the colony" and the Agras, as preventing that luxuriance of vegetation which is the planter's great difficulty in some of the older portions of Dimbools. Opinion was unanimous that further up the river and towards the great rampart of mountains of which Hackgalle, Totupola and Kirigapoha are the watch-towers, coffee planting was carried on, the more an Ouvah climate (perfection equally for healthy coffee and healthy planters) could be depended on. We saw extensive clearings in the gorge at and above 4,000 feet elevation, and a well-known planter, with whom we "forgather," held most strongly the opinion that in the nearer portion of Dimbools coffee could be successfully cultivated at an altitude of 6,000 feet. If this opinion turns out to be well-founded, we need not point out its important bearing of the question of railway extension. The question as regards these high altitudes resolves itself into one of warmth and wind. As far as warmth or rather heat, in the day hours, is concerned, we bore away with us from the neighbourhood of "the Gorge" the evidence of a blistered skin. As regards wind there is the great fact in favour of Dimbools that it forms no expanse of heated low country: the district is "self-contained"—walled round with a circlet of forest clad mountains. We saw some proof of the action of wind, however, on a fine young estate on the back of the Nanoo Oya, in branches covered with blossom buds, but with only a scanty supply of leaves. The planters made light of the circumstance, stating that the plants would speedily assume fresh vegetation and mature their fruit without suffering. The action of the north-east wind, is for some reason, said to be far less deleterious that than of the blustering south-west, from which the vast basin of Dimbools is protected by its mountain rampart. There had been a little more wind than moderate-minded men desiderated during the very numerous and extensive "burns" which had taken place just as we were approaching the great valley, and over the smouldering remains of which much of our journey lay. Two unexpected and undesired results followed the excessively dry weather and the strong winds of the early part of February. The burns were "too good," and in a great many cases the effects went beyond the limits calculated on. There was much good-natured "chaff" interchanged about patches of young coffee burnt off by too expansive "burns," the arrangement generally being that the originator of the "burn" should plant up the isolated patches. Our enterprising friends, the Messrs. Rudd Brothers have evidently communicated their own spirit of thoroughness to all the agencies they employ. If they choose in their splendid new venture at Wangie Oya to reduce hundreds of acres of what was grand forest to a glittering white expanse of potash, instead of being contented with charring the trunks and the bigger branches, no one can question their proceedings. But was it quite neighbourly to set fire prematurely to a clearing two miles off. The owner of the clearing calculated on a fortnight's more drying, and was rather more dismayed than grateful, we believe, when he saw the "spontaneous combustions;" but as the burn was a good one, we suppose all is right. In any case we, in the interests of tourists, who enjoy the sublime and beautiful in nature, enter our protest against any more attempts to burn down the Great Western. Our friends ought to rest satisfied with having given the old mountain so terrible a fright as he must have felt when the roaring flames rushed so far up his sides, in regions where even the Rudds could scarcely cultivate coffee successfully. Alas for the beautiful forest on which some months ago we gazed with so much delight, but which we now found replaced by desolation of bare surfaces broken only by confused masses of charred and smoking timber, reminding us most forcibly of the sides of Vesuvius after an eruption. And the fires which blazed and smoked in every direction were calculated vividly to recall memories of volcanic regions. Mr. J. A. Bell, of Hill side, Raxawa, with that refined politeness for which he is distinguished, (having by some mysterious agency heard of our intended trip up-country) set himself to afford us a treat. Just as we got above Gampola, on Monday the 12th, after enjoying the hospitalities of our railway-making friends, his clearing was fired, and often, *en route* to the Attabage and on the Pussaue road, which skirts its steep sides, we stopped and turned to look at the varying effects of pyrotechnics on so grand a scale. As in the case of a real volcanic eruption, the extreme top of the mountain (where the rock "Sentry" has stood watch for hundreds of generations) was undisturbed, looking down from its sublime calmness on what heat and air in violent action were doing with vegetable organization (and for that matter with a good deal of animal life—from quadrupeds to land shells) below, it was exciting to see the tongues of flame, vari-tinted from scarlet and copper to violet, fiercely licking up their provender, amidst veils of smoke which also varied in colour from the blackness of darkness to the loveliest ultramarine blue. So the flames and smoke rose and fell, flared to the sky and sank as if exhausted, for long hours, while beyond Raxawa were the evidences of what was going on in Dimbools, in masses of smoke

Volumed and vast and rolling far,

which enveloped the distant mountains and rose until they met in upper air the clouds of moisture they seemed to attract. It was believed in Dimbools that the effects of large fires was really to produce rain, and there may be true philosophy in the idea. From Holyrood, Scalpa, and Wangie Oya at the base of the Great Western to Hackgalla, Elbedda and Talangkande, there were evidences that the fire had passed over immense portions of the primeval forest, which we can recollect as utterly silent and unbroken, untouched by the feller's axe, with which now the echoes of the

hills and valleys are incessantly vexed. Fine times these must be for the Singhalese contractors, and no wonder, though a botique keeper explained his large stock of Mumm's Champagne by a reference to the advancing habits of civilization acquired by these prosperous gentry. They have come to despise their native arrack, choosing to imbibe the more exquisite beverage which is supposed to owe its origin to Nancy and Epernay. We were told that at least 8,000 acres of forest were being felled in Dimboola alone this season from which the Singhalese contractors will derive £16,000. Add £4,000 for bungalows, lines, and other works, and here is a total of £20,000 earned by this class in a few months. If they do not prosper it will be the fault of habits of which abundance of Mumm's Champagne in the solitudes of the forest, is an index. We saw no signs of drunkenness, however, although, curiously enough, a leading planter talked of applying for the establishment of a Government arrack tavern, so that the coolies might obtain "wholesome spirits" instead of the manufactured and deleterious "brandy" of the botiques. The Singhalese certainly have special aptitudes for handling the axe and for wood-craft generally. The friend who accompanied us to the Gorge stated that if he sent a dozen Tamils to fell forest, they would probably fell several of their own number by running in different directions and generally in the wrong one when, after a disproportionate period of time, they had succeeded in giving a group of trees the finishing strokes. The Singhalese contractors being paid by results, work with a will. We saw the effect of the contrary system in the case of four estate Tamil coolies set to cut a log which obstructed a bridle path. We came suddenly round a corner and found three out of the four sitting on the log, while the fourth was looking at his axe as if anxious lest it should suffer from the heat of over-powerful concussion. We are bound to state, however, that a planter in Kotmalie told us he had given his Tamil people employment in felling rather than discharge his surplus labour, and that the result was satisfactory. Having indicated that 8,000 acres of land will be cleared, burnt, and planted with coffee this season, and taking it for grafted that Dickoya will not be very far behind this figure, we need scarcely wait to point out the bearing which such a fact has on the question of railway extension. Our own position in the matter is clear and definite. The grand object of Government as proprietor of a landed estate with undeveloped resources, and with lands yielding exportable produce in widely separated districts;—as proprietors also of a railway, is to see whether extension cannot be so managed as to connect the separated districts, and concentrate all possible traffic on the railway. Engineering principles will largely guide the route of the railway, and provided Ouvah is reached at some central point, it is to us a matter of secondary importance what route is chosen. Two such authorities as Messrs. Harrison and Molesworth have pointed to the gorge leading up to Hackgalla; and Mr. Mosse, we understand, has a plan laid down which would carry a line through that gorge into Newera Ellia. But if the line finally adopted carefully avoids the gorge, for an outlet better in an engineering point of view and more calculated to add value to Government Forest, we beg sincerely to assure our readers that our support of the scheme will not be one whit the less zealous. A leading planter in Dimboola said to us that he did not see how he or others could benefit by a railway futher up than Navalapittia. But in the same breath he descanted on the heavy burden on carts of a penny per mile for mere road tolls, while we united in contrasting a quick, easy, luxurious transit in a first class railway carriage from Colombo to Peradenia for a little over 11s. with a bandy and horses from Peradenia to Dimboola, which would cost £5. With stations conveniently chosen, therefore, a railway extended beyond Navalapittia would inevitably benefit the planters of Dimboola and Dickoya, facilitating intercourse and commerce. We may notice in passing that the effect of the recent reduction in fares on the line at work has been most marked. The passenger receipts did not, as in previous years, fall off after the holiday excursions, but have gone on increasing. The trains up and down on the 12th, were long and crowded. On the engineering problem involved in the proposed extension beyond Navalapittia, there are still differences of opinion. A gentleman whose dicta are worthy of great attention told us at Kandy that he believed any line by Ginigathina to be "unworkable," while on the other hand what Mr. Grinlinton had shown to Sir Hercules Robinson's conviction to be the "unworkable" line up the valley of Dimboola our authority believed could be managed at a uniform gradient of 1 in 70 from Navalapittia into Ouvah. Nothing but a thorough examination by surveyors under Government orders and with the facilities which Government provides, can finally settle the question of gradient and route. We believe in no insuperable difficulties, and we believe in a fully paying traffic. The grand question, not only for railway extension but for Ceylon as a continued scene of profitable European enterprise, is "Will the traffic last?" Good as the climate of Dimboola is (we saw on Logie large fields with blossom buds as thick as they could lie not only on mature wood but on green twigs of three months' growth), the soil is admittedly not very rich; and fertile as the soil of Ouvah is, will it last for ever? So much "snuffed out" coffee land in the older districts around Kandy must, according to some gloomy prophets, be accepted as a premonition of the doom which awaits all. One gentleman, a traveller in Ceylon, had formed a [illegible] that all the steeper inclines on which coffee grows in Ceylon [illegible] be finally carried down into the valleys in like state as the [illegible] tain lands of Switzerland had been when the [illegible] timber had been removed. Such [illegible] of deep attention. We have not the [illegible] ice to contend with, combustion from sun heat and [illegible] are trying enough. Our belief is that with such [illegible] railways above all other agencies would render possible, [illegible] over large districts be rendered a permanent instead of a [illegible] source of wealth to Ceylon. But in fulfilment of our [illegible] ply our readers with materials for arriving at true [illegible] are most ready now as ever, to publish views the most [illegible] our own. A very able if exsanguineous correspondent [illegible]

"Are you not going a little too fast in finance? Thousands of acres of coffee worn or wearing out, is rather a discouraging [illegible] for a prospectus. Coffee planters signing themselves "[illegible]" too! What will be the use of harbours and railways when there is nothing to carry or ship, as must eventually be the case if coffee planters do not render their estates permanent. Surely some consideration is due to the other interests of the Island, upon which this terrible outlay will fall if coffee fails. Urge the coffee planters to study their business, and, as in other professions to bring science to bear. Their present method is mining, not cultivation. The climate and soil of the island have proved themselves abundantly able to grow coffee. The climate they may safely leave to K. B. T., but the soil they *ought* to keep up to the mark.

"I hear the cocoanut oil trade is suffering for want of cask timbers. Why do the exporters not imitate the French on the coast? They buy up all the beer casks all over India, and make them fit for oil by lining them with a coarse cloth and saturated with gum, which is soluble in water, but not in oil or spirit. Any timber so treated, I shoud think, would answer the purpose which is but temporary."

We scarcely think we are amenable to the charge of not urging on our planting subscribers the employment of all the aids of science in their cultivation. One of the greatest triumphs of science is the railway, and had we obtained this means of conveyance in the early days of coffee, planting we feel convinced that there would be less shew of support than exists in land abandoned, because it could not be manured, for the gloomy prophecies of those who point to decadence. We give all due weight to difficulties which must be faced, but we have now long experience to support our position that a bold policy is the safest. We believe that Ceylon can pay and profit by a Colombo breakwater and a railway to Badulla. There are cocoanut planters as well as rice cultivators who would profit by cheap and facile communication, so that we do not forget interests other than those of the coffee planters. It is because we believe all interests would profit that we advocate at least a full enquiry into the question of a possible and paying railway, connecting Colombo with Badulla. We hope in the face of all obstacles, (which we seek neither to conceal nor to under-rate), to see the scheme sanctioned, and perhaps completed.

We regret we were not able to visit the twin district of Dickoya from Dimboola. That pleasure is in reserve, we hope; meantime we are favoured with the following satisfactory report from one of the best possible authorities:—

New Valley, Bagawantalawa, 20th February.

"I have found this district in a flourishing condition, and as its founder feel a certain degree of pride in its beautiful appearance. I see no symptoms of leaf-disease; what is so called I observed many years ago, and it appears to me to be without any pretension to scientific knowlege, a fungus peculiar to decaying plants, and resulting from a deficiency of nutrition; in other words exhaustion of the soil. I am sorry to see on the Kandy side so many coffee trees in that deplorable condition, but here we have, and will continue to have, for many years an unexhausted soil, and I am glad to think the district is well-stocked with energetic young men ready to till a willing soil. Whatever turn the weather takes, we shall have an abundant crop, and the weather is all that could be desired, thanks to a beneficent Providence

"As regards the railway extension I think the best plan would be the tunnelling of the Gap Saddle, and sweeping round by the great water-fall at the village of Kahelgamena (not the Sinhalese Kail, but the real Kahel of Ceylon, hence the name!), and then up this valley which offers extraordinary facilities. The very sleepers could be found growing on the ground, and good sleepers too. Some physical difficulties will have to be overcome in the vicinity of the Fall, but those in an engineering point of view, are insignificant as would be the tunnelling of the Gap Saddle, and even that no examination may not be necessary. The line might diverge into Dimboola by the base of the Duke's nose or straight on in the direction of Happootella, skirting the beautiful Horton Plains, which possess the finest climate in the world.

"Our road has hung a long time on our hands and the worst portions of it are by no means well-made. The [illegible] obstructives threaten (or are said to threaten) to [illegible]

pioneers, but [illegible] can exist; if it does, it will [illegible] Fancy, being taxed for [illegible] all that thing, and now to be [illegible] of work.

"[illegible] are squabbles too, but they, on dispassionate examination, [illegible] into smoke. People should bear and forbear, and above all, direct their energies to the culture of coffee.

In our travels of course, we found the principal question which came before the late meeting of the Planters' Association, the subject of animated debate. All we saw and heard in Dimboola, a district specially referred to in the correspondence between Government and the Association, confirmed the views we previously held, that sickness and mortality amongst coolies and estates have in recent years been light. We therefore think it the more to be regretted that the planters by their persistent opposition (passive opposition) to the law demanding quarterly returns, should have placed themselves in a false position. The only exception we can take to the very able speech of Mr. Harrison at the late meeting, is its tendency to lay all the blame for the absence of statistics on the Government. Now we love the planters exceeding well, but we trust we love truth more, and we should certainly be committing high treason against truth if we were to say that the majority of the planters have shewn a willing obedience to the law which demands quarterly returns of births, deaths, &c., amongst coolies on estates. One gentleman whose conscientiousness we ranked very high, coolly told us that when a child died within four days of its birth, he did not take it into account or include either birth or death in his returns! But how important just such returns are, our readers can judge, when they learn that Government going on the evidence of one of the leading planters, ground their demand for medical supervision on the belief that infanticide is very prevalent amongst Malabar women on estates. The gentleman who impressed this conviction on Government, told us that of the children born, a large portion die soon after birth, either from active poisoning: from the withholding of nutriment by the cruel mother: or from the inherited effects of a loathsome disease, not due to our climate, but to the habits of the Tamils themselves, our informant's account of the prevalence and effects of which simply horrified us. Nothing was said of fever and nothing of dysentery except the fatal form of it which is connected with secondary symptoms in the internal organs. The truth is that, if the gentleman referred to should turn out to be correct, what is specially wanted is the application of the provisions of the Contagious Diseases Act to the coffee estates. Strong, broad-chested men the majority of the coolies are said to be, and where pure family relations exist a fine healthy progeny is the result. If the laws of morality and health were observed, our informant is of opinion that from mere natural increase in this way, a full supply of a most superior trained class of labourers could be always available in Ceylon. But men, women, and even children were described as struck down and absolutely rotting out of existence by the effects, immediate or secondary, of a foul disease, nature's retribution for violation of natural laws: for perverting instincts intended to perpetuate a healthy race into means for wide-spread destruction of life. Our climate is not blameable here, nor are dwellings or ordinary sanitation at fault. The European Superintendents too, according to our informant, are almost helpless. But if the evil is of the magnitude described, something surely ought to be done, not so much to satisfy the Indian Government as for the sake of our own interests, or rather for the sake of our degraded self-immolated fellow beings. The subject (shocking and difficult to handle as it is, but which necessity compels us to notice) will no doubt engage the earnest attention of the committee of planters appointed to confer with Government.—One more remark we have to make on the proceedings of late meeting. The complaint of the Government Medical Department was not that the hospitals were not filled with coolies, but that contrary to the experience of former years, coolies were not sent to the hospitals in a curable stage, but merely to die. The best cause has nothing to gain by any clouding of the simple truth. While there is good evidence of diminished sickness and mortality on estates, the fact remains indisputable that of late years coolies were sent to Government hospitals only when in or almost in the article of death. We are no advocates for—we are strong opponents of *undue* Government interference. But where human life is at stake, and where any evidence of even seeming neglect may endanger our supply of labour, stringent steps can be justified. The cry of "we object to anything being done" will not avail. We must have a full enquiry and full information, and we trust the planters will be the first to give the information which on the whole we believe, will turn out to be so creditable to them and so confirmatory of the belief, that the majority of them show the most humane care for the health and lives of their labourers.

We have left, consequent but scanty room to discuss other topics, but we must add that a severe and unexpected heavy fall of rain had [illegible] the progress of the railway bridge near Peradenia, and that the result of what we saw and heard on our journey does not render the idea of the railway to Gampola being open in time for the conveyance of the crop, the prospects of which are so good. The increasing traffic has told on the road between Gampola and Nevalapittia, and it sadly needs repair. Some of the bridges on this and the Dimboola road, a combination of precipice and curve unqualified by even the show of parapet, seem admirably suited for producing paragraphs headed "fatal accidents." Do parapets cost very much? Carriage of coffee down from Dimboola is plentiful and cheap, because much rice goes up to young estates and carters are glad to get return loads. But this state of things will alter as the majority of estates mature. The value of a railway will then become more apparent. Thunderstorms are rare in February, but we had one last night at Colombo, with a pretty heavy fall of rain. We hope to hear that only light showers favourable to the "setting" of blossom have been experienced in the planting districts. Heavy rain or strong wind at present would be injurious.

It is of much importance, after the disappointment of last crop that we should be able to send plenty of coffee to most good prices. Our planters are not sorry to hear that the United States Government has abolished the coffee duties. The prospect seems to be that the States will ultimately consume all the coffee Brazil can export. We are not so absorbed in our insular interests, but that we have felt deeply the horrible occurrence which has deprived the neighbouring continent of India of its popular and useful ruler. While we are waiting to welcome our new Governor, due about 3rd March, the posts of Viceroy of India, and Governors of Madras and Bombay, await the arrival of Lords Northbrook and Hobart and Sir Philip Wodehouse. Let us hope that all the new men will be able, good, and successful rulers, and that there may be peace in their time and beyond it.

Our readers will be interested in the following letter from Mr. Vetch, a gentleman formerly employed in the Survey Department here, describing a new mode of conveying coffee and rice over very narrow bridle roads:—

134, St. George's Road, Glasgow,
15th January, 1872.

DEAR SIR,—Trusting to the interest which the *Observer* takes in all that tends to the advancement and prosperity of Ceylon, I venture to hope that you will allow me a space in your columns in order that I may bring to the notice of the Ceylon public generally, and of the Planting Community especially, a method which I have devised for facilitating the transport of the two chief articles of Ceylon freight, coffee and rice.

The railway and cart roads have relieved some districts of almost all anxiety in the matter of how to get crop to market, but even in the more favoured districts, rails or metal are not so near to all the stores as could be wished, while in the less favoured ones they are at a distance, which lends neither enchantment nor view. It is primarily with regard to the improvement of these faulty links in the chain of communication between the store in the watte and the store in Colombo that I have devised my coffee transporter. The problem I have endeavoured to solve is: *Given a district which cannot afford the cost of a cart road, but can that of a good bridle road; supply it with the mechanical advantage of wheeled transport.* I have assumed that the road way for my coffee transporter will admit of a gauge of 2 feet, (although even less might suffice), that is to say, that the road on which it is to travel shall be sufficiently wide and in tolerable order for a vehicle 2 feet wide at its base. On these data coffee transporters, or, as I purpose calling them, "Cycles," may be constructed of various forms and sizes.

I have had two made in this country, the lesser of which is now ready for shipment to Ceylon: a description of this latter one will illustrate the characteristics of the Cycle.

The body of the vehicle is a hollow cylinder 3 feet from end to end, furnished with a circular opening on its surface through which the coffee or rice is poured in until the cylinder is full, when the opening is closed by means of a screw door; six inches from each end of the cylinder, within two feet of each other, iron bands girt the cylinder; to these iron bands are firmly fastened short wooden spokes, the other end of the spokes are let into felloes, and the felloes are tired with iron, like ordinary wheels. Thus it will be observed the cylinder which contains the load to be transported is furnished with an arrangement which answers the purpose of wheels; but, whereas the wheels of carts are *outside* the bodies of those vehicles, and so require additional width of road, the wheels of the cycle are *within* the width of the body of the cycle, and may be placed at any gauge without affecting the body or cylinder.

The wheel arrangement of the cycle projects 9 inches beyond the surface of the hollow cylinder, which it girts in order that the cylinder may not come in contact with the surface of the road, and as the wheels are riveted to the cylinder, when motion is communicated to the vehicle the whole cycle and its contents revolve. This ratotory motion of the contents would be a fatal objection to the use of cycles for freight *generally*, but such objection, I opine, could not apply to its use for either coffee or rice, as these articles would so thoroughly pack the hollow cylinder that there would be no room for such motion of the particles as would cause much if any damage; and it is with the easier transport of coffee and rice alone I am dealing.

The cycles are intended to be drawn either by coolies or bullocks, according to the size and contents.

The advantages of the cycle, I consider, are :—

1.—The breadth of roadway is thoroughly utilized, no space being required for wheels outside of body.

2.—The load is brought as near the ground as it is possible to do without actually touching it, and the centre of gravity can never reach higher than the axle.

3.—The cycle is more easily drawn than any other form of vehicle. This last-mentioned advantage is due to the symmetrical disposition of not only all the parts of the vehicle but also of the freight itself around the axis; the whole forming in fact *a wheel* having its centre of gravity exactly at the axis—a form in which matter can more easily be removed on a road than any other. A consideration of this very important advantage naturally leads to the question: if matter can be more easily moved—or to put it in more practical words, if a bullock can draw more in a cycle than he can in other vehicles, why not substitute the one for others on *all* roads? So far as coffee and such other goods as would not suffer injury from a rotatory motion are concerned, there is perhaps no reason why the substitution should not be made; but on the contrary, inasmuch as the more a bullock can draw the sooner and the cheaper can coffee be taken to market, there is most cogent reason for the adoption of the most advantageous form of draught. Nevertheless, the bandy is an old institution, and old institutions have deep roots; besides, the want of something better than coolies' heads and bullocks' back for transporting coffee and rice, seems more urgent, more appreciable, and less open to objection or doubt than improvements on the transport which already ply on cart-roads; and I see in the bridle road, and "Pathless woods" of Ceylon, a field where any improvement in the means of transport would receive nothing but welcome. Adverting to the second advantage above-stated, which I claim for the cycle over other wheel transport, viz., the low position of its centre of gravity, I see in it the means of adopting an extremely narrow gauge of tramway very cheap of construction. Such tramways as I contemplate might have a gauge as narrow as eighteen inches, or even less; the body of the cycle would extend beyond the rails of the tramway, but the load being of necessity symmetrically disposed, the centre of gravity would still remain at the centre of the vehicle, and no higher than its axle, hence the peculiar adaptability of the cycle for such narrow gauges as would be useful for ordinary waggons. But apart from the question of tramways, and reverting to the cycle I am now about to send to Ceylon, an inspection of it will I hope bear out my opinion that with a comparatively slight expenditure in the repair and construction of roads, coolies' heads and bullocks' backs may in many places be economically relieved of their burdens, and that the developement of coffee, and rice lands would be materially aided by the use of a vehicle so easy of draught, requiring so little width of road to run on as the cycle, which I hope I have satisfactorily shown to be Q. E. D. of the important problem I have above enunciated.

The cycle I am now sending out to Ceylon is of small dimensions, its capacity is equal to 10 imperial bushels, heavier, and of costlier material than I could recommend for ordinary use, the material is chiefly iron, for much of which wood might probably be advantageously submitted; but bearing these points in mind, it will suffice as a model.

I hope to place it on view in Kandy at some early opportunity, advertising the same in the *Observer*.

In the meantime if you will allow me the favour I have solicited at the commencement of this letter, it would be a means of introducing the cycle to the notice of your wide circle of readers, which would be gratefully esteemed by,

Dear Sir,
Yours very truly,
GEORGE A. VETCH.

We can only express the cordial hope that the cycle may turn out a great success.

The magnetic storm which was felt so strongly in India and as far as Aden, affected the telegraph wires in Ceylon. Details of the Meteorology of Colombo and Kandy will be found in our columns, as well as a notice of the efforts of Captains Fyers and Tupman to secure more accuracy in measuring heights by barometrical pressure. Our railway receipts as yet shew a reduction of only Rs. 11,000 on the corresponding period of the past year. We have heard with regret of the final retirement of Colonel Layard, of the Ceylon Rifles. He will be missed from Ceylon. His successor is a distinguished officer who, it seems probable, will be the last Colonel of the Malaya Regiment. The return of Mr. Douglas to resume his duties as Auditor General has caused some changes in our service, and more will be effected when the assumption of the Government by Mr. Gregory will send Mr. Irving back to his post of Colonial Secretary. The Colonial Steamer *Serendib* will bring Mr. Gregory from Galle to Colombo. Had he taken the usual land route he would have had a more favourable view of the approch to Colombo Fort than any previous ruler. The new Club on the Galle Face and the fine Military buildings add much to the appearance of our city. Gas pipes are being laid along some of our principal streets, and early in [illegible] Gregory the new light will be in [illegible] preached on behalf of the Bible [illegible] our impressions of his theology created by previous [illegible]. Our obituary includes the names of Mr. Risch, lately employed in the Bank of Madras, Mr. Capper, of the Public Works Department, Mr. George Gun Fraser, once in the Public service here, and Mr H. R. Godfree, a Planter.

Annexed is the usual return of Coffee exported during the fortnight :—

		Plantation.	Native.	Total.
5 ships for London with cwts.		35,589	5,000	[illegible]
1 do New York		5,050	1,[illegible]	[illegible]
6 ships	with cwts.	40,639	6,[illegible]	[illegible]
Total to 19th February 1872	cwts.	305,155	76,909	382,064
do 19th " 1871	"	317,192	46,[illegible]	[illegible]
	cwts.	12,037	30,367	18,330
		Decrease.	Increase.	Increase.

Distribution of Coffee Crop Exported from Ceylon from 1st October to 19th February 1872.

Places.		Plantation.	Native.	Total.
London	cwts.	264,147	67,591	331,[illegible]
Marseilles	"	325	400	725
New York	"	10,576	3,[illegible]	14,576
Mauritius	"	300	1,049	1,349
Port Said	"	540	300	840
Bombay	"	1	"	1
China	"	1	11	12
Melbourne	"	4,766	700	5,491
Hamburg	"	4,607	2,685	7,[illegible]
		305,165	76,909	382,074
	Deduct	250	"	250
	Total cwts	305,155	76,909	382,064

MARKET REPORT.

LONDON, 11TH MARCH 1872.

NO Public Sales were held to-day, and privately the market continues inactive. The coffee market remains inactive, the small quantity of plantation Ceylon by auction selling at about 1s. per cwt. under previous rates, and some parcels in second hands at a greater depreciation. Native kinds have been unsalable upon former terms. Owing to a falling off in the export clearances, the stock is now only 2,300 tons below that of the previous season.

SILK.—(From Messrs Killburn, Kershaw, and Co.'s Circular, dated March 7.) During the past three or four weeks the silk market has been quiet, buyers generally having held off, and importers, as a rule, declining to make any concession however slight, in cases where holders have shown any disposition to be moving, manufacturers have been willing to buy, and thus in China silk some daily business has been doing at slightly easier rates for the lower descriptions of Tsatlees. In Canton and Japans of recent import, prices have been fully maintained, and the former may even be quoted a shade higher than at the beginning of last month. Bengal silk met with some little inquiry for the common descriptions during the last week or two, and a few parcels have been sold for consumption; it would almost seem as though this silk is at last moving. Deliveries are satisfactory, being for the past month as stated in our table of stocks, and from the 1st to the 6th instant as follows :—China, 583; Canton, 149; Japan, 150; Bengal, 14; total, 126 bales.

SUGAR.—There has been less demand to-day at previous rates. 268 casks of British West India sold—Jamaica at 30s. 6d.; Trinidad, 28s. 6d. to 29s. 6d.; Demerara, 30s. 6d.; ditto, crystallized (24 hogsheads in auction), 38s. 6d.; syrups, 33s. 6d. 138 hogsheads Porto Rico partly sold in Public Sale, yellow and greyish, 33s. 6d. to 34s.; and 500 bags Mauritius privately, fine crystallized 38s. 6d. Refined has also been quiet at previous prices. 300 tons French loaves sold for delivery, Say's at 34s. 9d., f.o.b.—*Home News.*

CALCUTTA, 21ST MARCH 1872.

INDIGO.—Sowings are now mostly completed in *Tirhoot*, *Chumparun*, and *Chapra*, and so far the seed has come up well, and the young plant is looking healthy. By last accounts, the weather was rather unsettled, with appearance of rain, which is not wanted, as a fall at present would injure the late sowings. In most of the Districts of *Lower Bengal*, more particularly in *Kishnagar* and *Jessore*, rain is wanted to freshen up the October plant, and to enable planters to fill up such of their lands as are still unsown. In *Burdwan Bengal* the plant is holding out well, but stands much in need of a good fall of rain.

RAW SILK.—The tone of the market remains unchanged. The chief transactions since our last issue, are :—26 bales J. & S. W. Sordah B. November Kumd. at Rs. 22-12; 5 bales W. & G. M. Jorahat at Rs. 21; 4 bales G. G. McF. Rangaty at Rs. 20-8; and ten bales J. W. at Rs. 17 per seer. Stocks remain low. *Cheesa.*—Only a small business has transpired, owing to the continuance of supplies. *Cocoons.*—Fine qualities are still in request at high prices. *Cocuts.*—No sales of importance are reported.

The Str. "Melnam" cleared on the 18th instant, with 34 bales Raw Silk and 36 bales Silk Cheesum for Marseilles, 18 bales raw silk for Lyons, and 738 pieces Cocuts for Paris.

TEA.—There has been very little doing in this article during the past week, and as nearly the whole of 1871-72 crop has now been disposed of, our market may be said to have closed till May next, by which time the few first parcels of new season's will be probably arriving. The Public Sales have comprised 331 chests, 27 of which were withdrawn and the rest found buyers. Very full prices ruled for all descriptions. The weather reports from the various districts are pretty fair on the whole; rain has fallen in most parts of Assam, as also in Darjeeling and the hills lower down. [illegible] partial showers, and a good steady downpour is [illegible] in this district. Manufacturing on a small scale has commenced in Assam and Cachar, and will no doubt be general by the end of the current month.—*William Moran and Co's Market Report.*

SUPPLEMENT TO THE "INDIAN ECONOMIST."

THE Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

VOL. III.] BOMBAY, TUESDAY, 21st MAY 1872. [No. 10.

Agricultural Gazette of India.

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LETTERS TO THE EDITOR.

MINERAL AND SALINE MANURES.—V.

To the Editor of the
Agricultural Gazette of India.

THE maize and Indian corn of India, having greatly degenerated, fresh seed from America, Spain, Australia, and Egypt, should be imported. The American seed being first grown on the hill seed farms, and this produce on the seed farms of the plains, by this means the constitution of the plant will undergo a gradual change, and the grain will ripen in September and October, thus enabling the zemindars east of Allygurh, to prepare their lands for the winter grain crops, to wit, wheat, barley, oats, and gram.

If the imported maize seed be sown on the plains as received, the cobs do not ripen till the end of October or first week in November. In the Futtygurh district of the North-Western Provinces, this lateness in ripening seed, compelled the growers to remove the crop in its unripe state, to prepare their land for the winter cereals. The loss and disappointment gave the *Billatee makkee*, (European maize) a bad name, owing to which it was not sown again as a field crop.

The American maize will degenerate in the second year if the land is not limed. On this point I speak from personal knowledge and experience.

In the Madras Government Farm, *Queensland Maize* was sown with success. One average-sized cob yielded more grain than twelve cobs grown at *Vellore*.

I never took the trouble to count the seeds on my 14 and 16 inch cobs, though to judge by the eye, one seed of the American maize was larger than three of the common hill maize. The flavour between the two was most remarkable, and can only be described in words by applying superb to one, and execrable to the other. The one gave a mouthful of rich sweet tender juicy food, the other an insipid matter, and an amount of hard skin, which could neither be masticated or swallowed. Maize and Indian corn are very extensively used as bread stuffs; they are more fattening, though not so nourishing as wheat, and as their grain is valuable both as an article of home consumption and export, every attention should be paid to their improvement by proper culture; suitable prizes being awarded for the best, and second best growths.

Barley is cultivated on a very large scale throughout India, the grain when hummelled and ground into flour, is made into unleavened cakes, and eaten by the natives. The flour merchants (*Bunnias*) use it to adulterate wheat, maize, and Indian corn flour. An immense quantity of barley is consumed as horse food, some giving it in the parched, and others in the raw state. The following analysis by "Einhop," shows its inferiority to the superior cereals, viz., "one thousand parts of the best barley contains 720 of starch, 56 sugar, 50 mucilage, 36·6 gluten, 12·3 vegetable albumen, 2·5 phosphate of lime, 68 fibrous or ligneous matter, and 100 of water."

The barley of India is far inferior to that of Europe, and the fact is established in three different ways. 1st, as regards size, inspect a hand-full of English pearl barley, and with it a pound of the best-sorted Indian barley, and the eye will tell at once the superiority of the one as compared with the other; 2nd, the Himalayan brewers, though second to none, in a practical knowledge of the profession, cannot brew beer equal to English, because the barley is deficient in sugar or saccharine matters, and over-abundantly rich in mucilage; 3rd, the Indian bred horse, in addition to other peculiarities, is remarkable for his weak and slight bones; a direct proof, that if the best English or Scotch barley contains 2½ parts of bone phosphate, in one thousand of grain, the Indian barley must contain a very small percentage indeed, to produce a degeneration so marked, widespread, and general.

No amount of culture will cause the barley plant to change its nature and to enrich itself in the phosphate of lime, and when we bear in mind that an ordinary daily feed of 8 lbs. of barley, given to a young growing horse, or mare in foal, contains at the utmost only 140 grains of bone-forming material or phosphate of lime, the connection between the deficiency and the degeneration is at once established. To give a *mare in foal* barley, to continue it whilst she is in milk, and then to feed the colt and growing young horse on the same diet, is, beyond a doubt the shortest and most effectual way of producing an animal, whose legs are unequal to the task of properly supporting and carrying his body.

I admit that the Arab and Bokhara horses are fed on barley. But then the former gets dried dates, (the bread of the desert), and the latter celebrated lucerne of Bokhara, which being grown on fertile soil, is remarkably rich in the food phosphates: further, the pastures are of the best, and as a natural consequence sand or *Silica*, is not the principal mineral matter in the green grass and hay, as is the case in India from Patna to Peshawur. Barley for full-grown horses, is not objectionable, but none save a native would expect perfect development of bone from such food. I may now mention that the celebrated *celestial barley* of Thibet (a country in which the gram of India grows wild, and whose pastures are so vast, as to be known as "the land of grass,") was sent to Scotland, and was found to be decidedly inferior to Scotch barley. The barley of Spain is also very good, and seed barley from both countries should be imported in the ear, that from Scotland being acclimatized in the hill seed farms, and the Spanish in the Umballa and other Northern farms in the plains.

Gram or chick pea: this grain which is neither a pea or a bean, is freely eaten as food by the natives of India: the white variety is reckoned the finest, and comes from Affghanistan. It is called *Cauboolee chenna*; there are yellow, green, and black varieties to be met with in the Punjab, the brown-coloured however the commonest, and grows anywhere. As this grain stands the very severe winter of Thibet, it might safely be introduced into Scotland, Ireland, and Wales.

Gram is given to horses either alone or mixed with barley, both being very often parched and ground together, in which state it is called *Urdawa* in the Presidency of Fort William or Bengal. The mineral matter of gram resides chiefly in the skin or husk, and its straw is much, and very properly valued as fodder, both in the green and dried state. This gram is undoubtedly very nourishing and fattening, and if it contained a sufficient supply of the food phosphates, it would have been almost invaluable. This defect, however, can be very easily got over by soaking the gram in water, in which the proper proportions of the alkaline phosphates have been dissolved. The earthy phosphates with iron could be added in a dry state, and so incorporated into the food.

I have no analysis of gram, but subjoin one of peas, which in their green and dry state very much resemble gram; according to "Will and Fresenius," the ashes of peas contain of:—

Phosphoric acid	34·01
Alkalies	45·52
Alkaline earths	9·61
Silicic, and sulphuric acids	10·86

The pea and gram contain *vegetable caseine*, and to quote the words of J. Dier, afford a remarkable proof of the true nature of vegetable caseine. That gentleman, in his report, states:—"The Chinese, it appears, are in the habit of making a real cheese from peas. For this purpose, the peas are ground into meal and boiled to a thin paste, which is passed through a sieve, and coagulated by the addition of solution of gypsum. The curd is treated like that formed in milk by means of rennet. The solid part is pressed out, and with the addition of salt, is wrought into cheese in moulds. This cheese gradually

acquires the smell and taste of milk cheese. It is sold in the streets of Canton, under the name of Taofoo, and when fresh is a favourite article of food with the people of China.

The labouring classes of England, habitually consume bread and cheese. The cheese is rich in bone and muscle forming mineral matters, the presence of all the food phosphates in wheaten bread has been explained, and the result of the diet is proved by the agricultural and out-door labouring classes of England, being the strongest of the strong.

The recruits required for the Royal army in India, are drawn from these classes. They are growing young men, who require an ample supply of bread and cheese for the due development of their bone and muscle. They are sent to India, and placed on Indian rations, the bread, though of the best quality, is deficient in the food phosphates; of cheese they never get an ounce, and as the meat (beef or mutton) is likewise poor in phosphates, the result is just what it should be. The growing men, deprived of growing food, soon become weak, lose their original stamina, and rapidly succumb to diseases brought on by unsuitable food, washed down with that alcoholic poison called Bengal rum.

My Lord Sandhurst, proposes meeting this evil by sending out recruits who have done growing. The more effectual and far less costly plan would be, to send out young men, who should be kept on the hills during the summer and rains—be sent to the plains from October to March, and thus be acclimatized in Upper India. The Commissariat Department should make arrangements for securing ample supply of good cheese from England, and instruction in the art of making *vegetable cheese* should be given to soldiers' wives. The curd should be seasoned with the alkaline phosphates. Rum should be abolished, and whiskey used in its stead. Finally oatmeal porridge, made from imported oats or oatmeal, should be always available for breakfast and supper. If this plan be adopted, the young European recruits will develop into fine, healthy, well-formed men. The old hands will become stronger and less liable to disease. The women will obtain a new lease of life, and the children being provided with wholesome growing food, will no longer subside into premature decline and death.

The people of India, when taught, will soon prefer vegetable cheese and oatmeal cake to *Bajra* cakes and salt, and the way will be paved for arresting the physical degeneration of the race.

Oats grow very well in the North-Western Provinces and the Punjab, including the Simla Hills. The agricultural classes of India have yet to learn the art of making oatmeal, and enjoying the cakes and porridge made therefrom.

If the cultivation of this most valuable grain was encouraged by Government, announcing its intention of feeding Cavalry and Artillery horses and stud cattle on oats instead of on barley, the zemundars would gladly grow it.

The seed oat should be obtained from Scotland in the ear, as grain so sent out, is not spoiled, and dries in the ear, without sweating; whereas, if otherwise sent, it sweats and spoils.

The analysis given shows how rich this grain is in the food phosphates, and accounts for the magnificent bone, muscle, and bottom, of the English horse

The ashes of oats contain of :—

Potash	12·94
Soda	2·02
Phosphoric acid	15·43
Lime	3·00
Magnesia	7·08
Peroxide of iron	0·40
Common salt	0·00
Sulphuric acid	0·49
Silicic acid in husk	58·97
["Mr. Porter"]	100·00

It will be observed that oats contain all the mineral matters present in wheat.

Potash and phosphoric acid are largely present, and the magnesia greatly exceeds the amount of lime. We see that no common salt exists in the oat, thus proving that the soda is not derived from its muriate (salt) but from the sulphate. Yet the quantity of soda nearly equals that of wheat.

The absence of salt and the presence of magnesia shows that magnesian lime was used as manure and not salt. From a consideration of these facts and figures, we may safely draw the conclusion that, in order to grow first-class oats in India, the seed will have to be sown on land well-manured with saltpetre, sulphate of soda, phosphate of lime, calcined magnesian lime, or if not available, steatite powder, and farmyard or vegetable manure applied as previously explained.

When the richness of oats in mineral matters (*per cent.*) is considered, as compared with the best barley, it is obvious that this grain is eminently adopted for use as horse-food. The only deficiency, that of lime, can be easily made good by the use of a tea-spoonfull of pounded chalk, or lime (*chunam*) deprived of its causticity, and with this addition we obtain a perfect food for the mare in foal, the colt and young horse, as also for the full-grown mare and horse.

In order to deprive lime of its causticity, boil equal parts of *gur* or *jaggery*, and *chunam*, together for an hour, with twice their weight of water, making good the loss by evaporation. After the hour is up, reduce the fire and gradually evaporate the water, till the mass is reduced to a plastic state, when remove from the fire, and allow it to cool. One ounce of this compound will contain nearly half an ounce of lime.

After the explanations and information given, it cannot be doubted that the degeneration of the cattle and various breeds of horses in India is almost entirely due to the grass, hay, and corn (gram, barley, and oats) consumed by them, being extremely deficient in the phosphates of soda, potash, lime, magnesia, and iron.

We know that the principal mineral matter, in the best grass of the country, is sand or silex, and as this is also the chief ingredient in Indian barley and oats, it follows that, until the food is improved by proper cultivation, it is hopeless to expect any improvement in our horses and cattle.

The private horse-breeder may use artificially prepared food phosphates, which will form the subject of the next letter.

H.

THE NEILGHERRY ESTATE.

(FROM A CORRESPONDENT.)

THE weather at the commencement of this season did not promise so well for agricultural prospects, as is generally the case. From the 15th of December last, up to the 20th April, no rain fell in Ootacamund. Coonoor and Kotagherry though more favored, did not get two inches of rainfall during the first quarter of the year. Such a drought is almost without parallel in the annals of the district, and unlikely to occur again. A welcome change for the better has now set in, and rain is now falling heavily throughout the district.

Coffee prospects began to look gloomy, planters fearing that if the drought held on for another fortnight, the blossom would not set, and all their hopes of the abundant for the present season, have ended in disappointment. In most parts of the district however, the rain though long deferred, has arrived in time to save the crops, and the prospects of the coming season have brightened up considerably; probably the only part of the district which will suffer materially in the way of out-turn, is the Ochterlony Valley.

The Tea estates of the Neilgherries, which are assuming more formidable proportions year by year, promise well, and the out-turn for the present season will not fall far short of 60,000 lbs. This result cannot fail to be satisfactory to those concerned, when it is considered that there is hardly an estate on the Hills with tea in full bearing, and that at least 60 per cent. of total area under cultivation has not yet come into picking.

We may reasonably expect that estates well cultivated, will give, when mature, from 350 to 400 lbs. per acre, and when the cost of cultivation has been duly provided for, leave a large margin for profit.

Hopeful prospects of the future of Indian tea reach us from all sides; not only are the quantities imported increasing every year, and the prices of fine qualities rising steadily, but fresh lands are being brought under cultivation at a rapid rate; added to this, the increased consumption of the article in England bids fair to make the enterprize one of the safest investments for European capital and industry that has never been set on foot in India.

The past drought has not in any way affected the out-turn of tea from the Neilgherries for the present season. The plants have had a good spell of rest; now that rain has come, the vitality of the bushes has been excited to a marked degree, and the shortcomings of the past few months will soon be made up.

As regards the quality of Neilgherry teas, a fair opinion may be formed from the result of sales of the shipments sent home last season. Prices ran from 1s. 8d. up to 2s. 11d. per lb. in London. These figures speak for themselves.

Though these teas cannot in the mere matter of strength compete with those of Assam and Cachar, their great delicacy of flavour and good appearance, cannot fail to give them a high position in the English Market, and when a better class of plant has been more generally diffused over these Hills, the Neilgherries should prove to be one of the best tea-producing Hill districts in India.

That cinchona cultivation will be found highly profitable, remains yet to be seen. The prices realised by the consignment sent home by Government, are eminently satisfactory, but at the same time it appears that our barks cannot compete for a moment with those of South America, as regards quality. Again, considering the large acreage that the Government have under cultivation, there is but little room left for private enterprize. The present existing gardens may pay for some few years to come, but eventually give way before reduced prices and the immense quantity of barks that Government send into the market.

The system of mossing, as carried out in the Government gar-

gens, seems to deteriorate the quality of the bark, and in all probability the coppice system of cultivation will come into favour. It must undoubtedly be a hard trial to a tree to have to reproduce its bark year after year, and its energies spent in this direction interfere materially with its power of growth. There is hope that time and experience may overcome all difficulties, and that the majority of estates, even if they do not produce as much as tea or coffee, may not prove a source of loss to those who have attempted the experiment.

In a very few year's time, the revenues of the district will have expanded very considerably under the influence brought to bear by private enterprize. There are yet many hundred acres of forest and grass waste lands, which are capable of profitable cultivation, and as means increase, the road communication of the Hills will be better developed, and more planting districts be brought to light. Pioneers have naturally rather a hard time of it at first, and must be prepared to submit to temporary trials and reverses. But when once labour has been introduced, excursions opened, and supplies become procurable, the leading obstacles are overcome.

Certainly no Hill district in India can hold out greater advantages to the European settler than the Neilgherries, where Nature has distributed her bounties with so lavish a hand, and the settler has no difficulty in finding in an occupation congenial to his tastes.

There is, however, a very great need in most cases; reluctance on the part of Government to selling forest lands on the Neilgherries. No doubt if the Hills were wholly or even to any considerable extent denuded of their timber, a serious diminution of the annual rainfall would take place; at the same time a certain acreage of forest might be sold every year, and the bad effects which such a policy would seem liable, be counteracted by the Government extending their operations as regards the planting of Australian trees, and inducing private individuals to do the same; or else, the Government might bind the purchaser of forest lands to plant out as many acres of Australians as they felled of the natural timber trees. By the adoption of either of these methods, all fear of the diminution of the rainfall would cease: in fact, it might actually be increased by these timely measures.

That the cultivation of the Australian Eucalypti has proved a success here cannot be denied, and so valuable is timber, and so rapid the growth of the plant, that an acre of these trees when six or seven years old, is quite as equal as an equal area of coffee or tea. These trees will grow and thrive in almost every soil, and the annual fall of the leaf year by year, enriches the surface of the soil, and in time renders it incalculable for other cultivation.

Among the kinds which seem to have thriven best here up to date, are Eucalyptus Globulus, E. Kallophylla, and E. Marginata. The first-named is of very rapid growth, and yields a timber useful for many purposes. The second, which promises to prove the handsomest and most valuable of all, is of equally rapid growth and the most superior. The third and last, though slower in growth, yields a wood, little if at all inferior to Mahogany or Teak.

The cultivation of these trees cannot fail to be profitable, more especially when the trees are grown near a station. Fuel is not very abundant on these Hills, and the great part of what there is, is of no avail for want of means of carriage at a moderate cost. When the Railway comes to the foot of the Hills, the value of wood suitable for fuel, and the demand for it will rise rapidly, and those who have taken time by the firelock and raised a good acreage of sound wood, will reap the reward of their labours.

EDITORIAL NOTES.

It may interest some of our readers to know that India cultivates seventy-seven different kinds of rice.

A MANURE is being prepared in France from Indian corn. The grain, coarsely broken, is subjected to the action of dilute sulphuric acid, which converts its starch into sugar. The refuse, after fermentation, is placed in large tanks, and after the solid matter has subsided, and the clear liquid drawn off, the residue yields an excellent manure.

2 MAY.

A NEW fodder plant (*Gymnocheir latifolia*), like the sugar-cane in appearance, has lately been introduced from Uruguay into France. It grows eight or nine feet high, and the fodder is, we are told, excellent, either green or cured.

THE Government of India appear determined to extend the cultivation of opium in the Punjab. Two experienced officers, says the *Pioneer*, have been ordered to Shahpore and Dehra Ghazee Khan to purchase the crop of the present season, and arrange for introducing the Bengal system next year.

WE are glad to hear that the Madras Government have sanctioned a grant to the Agri-Horticultural Society of Rs. 2,500 towards building a Botanical Library in the Horticultural gardens. The Society have many valuable books, of which little use can now be made, owing to the absence of a suitable building.

A LARGE supply of new vegetable seeds of various kinds, received by the Honorary Secretary of the Horticultural Society at Bangalore, is now open to the public for sale. The supply includes the *custard marrow, colossal asparagus, Goliath tomato, pixie cabbage, globe artichoke, &c.*; also a supply of Gladiolus bulbs.

THE following is the description of the Custard Marrow furnished by the Mysore Agri Horticultural Society:—

"A most delicately-flavored vegetable, in season when almost all others are over—must be grown in the early rains. For an early crop, seed may be sown after the middle of April in pots, and the young plants carefully removed with a trowel to prepared pits, when they have 3 or 4 leaves. more seeds may be sown in the ground in May and early in June, if sown later it will not fruit here. The difference in favor between the custard and the country kind is great, the fruit should be picked young. Marrows do well, grown on an old manure heap, and require a liberal supply of well rotted manure mixed with the soil they are grown in."

A MILL for grinding wheat by percussion, and without millstones, has been invented. While passing through the machine, the wheat is struck by a series of bars which move at an immense speed in opposite directions, reducing the wheat to a state ready for bolting. No injurious heat is thus caused, the flour produced being superior to that from ordinary grinding, while the cost is considerably less. One of these machines is now in full operation in Edinburgh. It rarely requires repairs, and when it does these are very light. Another advantage is that fewer men are required, and the consequent saving in wages.

IT would appear from a report of the Acting Collector of Canara, that certain returns for the preparation of Agricultural Statistics having been lately called for from the Revenue authorities, the ryots entertained an apprehension that they were wanted to raise the rate of assessment. The Collector had therefore to inform the cultivators that the information required was not for this purpose but simply to ascertain the producing power of the district and the progress of cultivation therein. The divisional tahsildars have been desired to explain to the ryots more fully, if possible, the object of these statistics.

ACTING on the suggestion of Dr. Irving of Allahabad, a trial was lately made to preserve the germinating power of imported seeds by placing them in ice. A tin parcel of American vegetable seeds, carefully soldered, was placed in the pit of the Ice House at Calcutta, while another of Australian seeds, similarly packed, was retained in the Agri-Horticultural Society's seed room. On examining them a year afterwards, the American seeds were found to have wholly lost their vitality, whilst the Melbourne ones were good. A trial sowing was made of the latter with very satisfactory results. Of the 21 kinds sown 3 only failed.

IT is not perhaps generally known that an oil can be manufactured from the yolk of eggs. We are told, however, that in Russia a large quantity is prepared for various purposes, among

which the better qualities are used for salad dressing, and are considered superior to olive oil, while from the more common kinds, the so-called Kasan soap is manufactured. The soap is too expensive for common use, and wealthy Russian ladies employ it only among cosmetics and toilet articles. It is also asserted that the oil has medical properties. Frequent applications of it soothe pain, and it is used by the colonists of South Russia as a means of curing wounds.

In the Zillah of Mirzapore, near "*Bidgegurh*," there is a mine of crude sulphate of iron, containing 39 per cent. of the dry salt. It is stated that the mineral may be obtained in almost any quantity, *vide* Report of Mr. Geo. Osborne, Opium Department, October 1868. Sulphate of iron, called *Kusees* by the natives, is also met with in the Himalayas and the Punjab. It is very cheap and abundant in the markets of London and Liverpool. Its mode of application is fully explained in Lieut. Pogson's Handbook of Agriculture, Part 1st, Chap. 2nd, Manures.

In reply to an enquiry lately made by the Board of Revenue, as to the Madras Farms affording any facilities for conducting the experimental cultivation of tobacco, Mr. Robertson, Superintendent, in a letter to the Secretary, observed that the tobaccos grown on the best soils of the farms were lately analyzed by Mr. Broughton, with results shewing conclusively that no tobacco of good quality could be produced there. Mr. Broughton tested two different samples of tobacco from the farms, to prove that the ash of the one contained 0·6, and the other 0·67 per cent. of potassic carbonate. This was quite fatal to the quality of the tobacco, and Mr. Broughton was of opinion that the soil in the neighbourhood of Madras could scarcely be made to produce tobacco of good quality, though the specimens were well-grown and carefully cured. Mr. Robertson observed, that while the ashes of the best American tobaccos contained as much as 25 per cent. of carbonate of potash, and some as much as 35 per cent., the ashes of neither of the samples examined contained 1 per cent. of C. of P. Not only were the soils deficient in potash salts but they were very poor in lime, phosphoric acid, soda, and other important ingredients of a fertile soil, a system of cultivation continued for years having produced on these soils an almost perfect exhaustion. The experiment proved most conclusively that the tobacco was of 'no use' for the European Market, and for the Native it was produced at too great a cost. Under these circumstances it would not be advisable for the Board to incur further expenses in experimenting upon the cultivation of high-class tobaccos on the Madras Farms. The letter will be found in another column.

A correspondent takes exception to the common statement that the people of India are averse to adopting improvements. He says,—The native of Hindoostan is often accused of apathy, neglect of his own interests, and of an antiquated and obstinately conservative turn of mind, incapable of appreciating, and averse to follow, imitate, and adopt any of the customs or inventions of the Western people. The notion, though partly true, is not wholly so, for the natives *have* adopted many western inventions though in somewhat rude fashion. That they do not (as some would have them do) adopt more, is often not from any disbelief in their efficiency, but because knowing their own business better than their critics, they are aware of the impracticability of so doing. Many of our improvements are too far ahead of him and his requirements. The people have imitated more or less all their conquerors from the Greeks downwards, *i. e.*, imitated any practices which they think *likely to pay*; but the native is never in a hurry. When natives refuse to have anything to do with a European invention or improvement recommended to them, it may be taken for granted, with tolerable safety, that the improvement is either too expensive, that he could not repair it if broken, or that it is unsuited to the climate,—in fact that in some way or other it would not answer his purpose. It, of course, occasionally happens that he ignorantly assumes the inefficiency of certain agricultural methods, &c., &c. This however is quite as pardonable as our greater ignorance of him and his wants, which we may be said to display daily, and of which the native being well aware, is the more disposed to question the value of the advice and recommendations which we offer him.

MISCELLANEOUS NOTES.

Maize was generally considered till now, to be indigenous to the soil of the New World. This claim has lately been contested, and Chinese records are cited to prove that it was cultivated in China prior to the discovery of America. Chinese authors maintain that it was introduced into China from the West, long before 1517.

A vine now grows in the garden of a draper at Victoria, which we are informed, covers an arbour 48 feet long by 8 feet wide. The vine was planted ten years ago, and at present bears four crops. The first yield of a number of bunches weighs six pounds each, and the smallest of them one pound. The leafage is luxuriant, affording a cool shade, and the fruit looks very tempting.

A new lactometer has been devised for testing the richness of milk by its transparency. Two polished glass plates are so arranged that their distance can be varied by a screw. These are placed before a candle, while the milk is poured between them, and they are screwed together; the poorer the milk, the sooner does the light of the candle become visible through the mass.

If we dip a feather in dilute muriatic acid, and hold it over fresh or fermenting manure, dense white fumes will appear, which are owing to the ammonia uniting with the acid, and forming a visible cloud, which is a true neutral salt in vapour. The same result will be obtained if the feather be dipped in vinegar, and held over the mouth of an open bottle of smelling salts.

A contemporary states that hens fed in winter, with boiled nettle-leaves, will continue to lay during the entire season. In Denmark, after the leaves have been dried and ground, a handfull of this nettle dust is mixed with the oats and given three times a week, morning and evening, to horses, with the effect of making them "fleshy," as Yankees say, and their hair unusually long, giving it also a fine silky lustre.

The *Delhi Gazette* writes of the existence of a tree in Venezuela, called the *Galactodendron Utile* or "Cow Tree." For several months in the year its leaves are not moistened by a shower, when the branches look dead and withered, but no sooner is the trunk bored, then a bland and nourishing milk flows freely from it, especially at sunrise, when the natives come from all quarters for the milk. Some empty the contents of their vessels on the spot, while others carry the milk home to their children.

The *Chicago Tribune* lately witnessed a reaping machine which well illustrates the extent to which labour-saving implements are being introduced in America. A farmer of Wisconsin, with glove on hand and an umbrella over him, was sitting on a machine reaper with as much comfort as if he were driving a buggy. The machine was cutting oats, which it threw as they were reaped into regular sheaves for binding and stacking. The farmer was doing with a single pair of horses, more work in a day than twenty-five men could have done by hand.

The *Farmer* writes of a woolly horse, a four-year-old colt of an Oregon mule, said to be a genuine curiosity:—"It is a sorrel animal, standing 14 hands high, weighs 800 lb., has the ears of a horse, and a tail nearly resembling that of a mule, while in the contour of its head it is more like a zebra than either a horse or a mule. There is no mane at all, and the entire body is covered with a fine, silky, close-curling wool. It is a veritable woolly horse, and no humbug. It was born of a female mule, on the farm of a Mr. Dougherty, of Curry County, Oregon."

THE *Farmer* publishes a new method of packing butter, which a Michigan dairyman has contrived:—

"He has oaken tubs with hooks at each end. They are 14 inches in diameter at the top, 9 inches at the bottom and 18 inches high. In packing, a cambric bag is made to fit the tub. The butter is packed in the tub as it stands on the small end—the sack being long enough to extend above the edges of the tub—and is pressed down firmly until within 1½ inch from the top, when a circular cloth is laid over it, the edges of the sack turned over that, and a layer of fine salt placed on it. The head is now put in its place, the tub turned up, and the butter in the sack of course falling down to the bottom, leaves a space all round it, which is filled with brine poured through a hole in the small end. When full, the hole is corked up tight. The butter floats in the brine, and is effectually preserved from the air, and will thus keep for an almost indefinite period."

AN instance of a cow having four calves at a birth, is related by the *Farmer*. The cow is reported to be of the Ayrshire breed, and belongs to a Rev. Mr. Myers, of Benholm. She is about eight years old, of small size, and if fat would weigh about 23 stones of 17½ lb. each. She was served by a shorthorn bull, and was within a fortnight of her reckoned time for calving. "One morning, in going into the byre, the minister's man found a dead calf behind her, and as she was evidently still distressed, she was watched. About 10 o'clock she produced a live calf; about two hours after, a dead one; and about 10 P. M., a fourth one, which was dead. All were perfectly developed, without any deformity or defect, completely covered with hair and with hoofs, &c., entire. The first was a male, the rest females. The first, third, and fourth born, which were still-born ones, weighed 25 lb., 20 lb., and 30 lb. The live one is larger than the largest of the dead ones, but it was not weighed. It is a heifer calf, and is very lively and vigorous, and promises to live. If it reaches cowhood, it will be interesting to see whether it is equally productive."

AGRICULTURE IN EUROPE.

COMMON SENSE FARMING.

MR. W. H. WHITE writes as follows to the *Albany Cultivator*:—

We have scientific agriculture, scientific farming, farming as an art, &c., treated ably and at length in our agricultural and other journals, and why not as well have it in plainer, more common words, common sense farming, except for the sound of the thing?

Science and art are words too indiscriminately used generally. As I understand the terms applied to agriculture, science would seem to mean theory, as the science of agriculture, theory of agriculture; the art would be, theory or science, applied in practice. While theory may be visionary, art must be real; yet we can scarcely have the one without the other, for art to be art needs the theory first to arrive at it; and art is improved upon by theorizing, and applying that theory according to common sense and sound judgment.

While little direct practical or absolute knowledge can be obtained from mere theory, or the reading of the theorizing of scientific writers, yet they are valuable auxiliaries to the advancement of art, and the understanding of the nature and composition of soils, plants, &c., and also the same of manures, their proper application to the soil in order to be the greatest advantage to the particular crop which they are designed to benefit. Common sense and sound judgment, used with discretion, will learn to determine with accuracy the adaptation of any theory to particular circumstances, and in applying the same careful experiment on a small scale, will soon determine its practicability.

Agriculture or farming is governed by fixed principles, just as much as any other branch of business; and to pursue it advantageously, the farmer must be quick of preception, far seeing, and energetic in action; he should be able to see the end from the beginning, accidents excepted, and be able to decide questions, and be fully persuaded in his own mind after short reflection, and not be unreasonably influenced by every "wind of doctrine" or opinion expressed by others. He should be able to comprehend "that circumstances alter cases" what may be the best course under certain conditions and in certain localities. Common sense, governed by sound judgment, would seem to determine these questions, and also to sift the practical from the impracticable, as applicable to his particular circumstances, in the writings and experience of others communicated through the medium of the press or otherwise.

Perhaps we can arrive at a better understanding, and I can more clearly define my proposition by typifying the management of the common sense farmer. Upon entering into possession of his farm, he makes himself acquainted thoroughly with all its parts, studies its capabilities, and notes wherein it is lacking, and the cause, together with its ideal remedy. Does any portion of it shew that there is an excess of water in the surface soil, he at once decides that this portion needs draining in order to carry off this surplus water; and forthwith he sets about its accomplishment, progressing with it as his circumstances will admit of its accomplishment.

He stocks his farm with such stock as he finds it best adapted to, keeping in mind profit and local circumstances. His stock is judiciously selected, and that which is likely to prove the most profitable of its kind; correctly judges that the farm is well capable of carrying so much stock, and that amount he does not attempt to exceed; so that, as the season comes round, his stock, instead of barely holding their own, advance in value as well as in condition; he understands that it costs no more to keep good stock, and in good thriving condition, than it does to keep poor stock in low condition; for, while a fine pair of oxen will readily sell for 300 dols. or more, a different pair will sell for no more than 150 dols. to 200 dols. A smooth likely colt of a year old, out of a blood dam, and sired by a superior horse, will sell for 200 dols. to 300 dols.; one from an inferior dam and scallawag sire will be dear at 50 dols.; and while the one kept till four years old, will readily bring 500 dols. or 600 dols., the other will bring no more than 100 dols. to 150 dols.—while the cost of raising the better, after foaling, is but a trifle if any more than the poorer, and while one pays a handsome profit, the other scrugely pays cost. So of all his stock; all he raises is the best, and well-cared-for while young. His land being well-drained, he is enabled to commence ploughing much earlier than his neighbour on undrained land, and he gets his seed in earlier, and in better condition, to bring him a good crop. He ploughs his land in a workmanlike manner, and if it has been ploughed only 6 inches deep heretofore, he ploughs 1 or 2 inches deeper, following with a subsoiler where necessary.

If he has manure only sufficient to manure 5 acres, he does not spread it over 10 acres, considering that there is greater profit in growing the same amount on 5 acres that will be produced on the 10 acres; he husbands all his resources for manure, and studies its economical application. He attempts no more than he can accomplish with what help he can command. He adopts a system of rotation of crops, adapting the crops to the soil and circumstances: understanding the theory, he finds it stands the test of practice. He adopts a system of accounts with his farming operations, and can tell you the cost of production of any product of the farm, and at the close of the year he *knows* whether he has worked his farm at a profit or met with loss. He grows no crop, nor continues the production of any article, that he finds pays no profit, implied or real.

He provides the most approved, best constructed farm implements, of whatever kind he finds indispensable, well understanding that more work can be accomplished with the same power, and that they will last much longer to pay extra costs, &c.; and then he is particular to keep them in thorough repair, and after using them, cleans and puts them in their appropriate place in the tool-house; has "a place for everything, and everything in its place," well knowing that time, which to him is money, is saved in so doing. His fences are always in good repair, and of sufficient height and strength to turn all ordinary stock; his buildings are all in good "apple pie" order, well-painted, in perfect repair, &c.; all conveniences are arranged, not only to perform all necessary work pertaining to out-door, but also for the saving of labour in the house, dairy, and domestic departments. His workmen are instructed beforehand what the work is to be, and what is expected of them the next day, and by endeavouring to get them interested in the forwarding of his work, finds his own profit. He uses them well, conciliating their goodwill, without making himself too familiar. In the general arrangement of his farm operations, he so plans his work that each kind is done just at the right time; if he is to plant, his land is thoroughly prepared, manure, &c., ready, and the seed put in properly in its season without delay, except by unpropitious weather. His grass is cut for hay when it comes into just the right state, and never injuring by overcuring, drying, &c., and stored in good tight barns.

He provides for the contingency of short pastures by sowing fodder crops, to be drawn on when feed begins to grow short in his pastures. He also provides good comfortable stables for all his cattle, and sees that every desirable comfort is enjoyed by them. In short, he has a system of operations, and works by system, knowing that little profit can be derived where order and system are ignored.

At the beginning of winter, his arrangements are ready to meet the season's advance; his well-filled garners shew that his season's labour and toil have been well-rewarded, and when the year comes around, he finds his balances tell on the right side of the account.

Amid all his labour, he has not been unmindful of that needed recreation so necessary to the system; he has visited among practical farmers, observing their practices and operations, endeavouring to gain wisdom thereby, and withal, he has not forgotten to provide suitable reading for his own and family's

instruction and entertainment during their leisure hours. Neither does he neglect his farmers' club, cattle-shows, or fairs, but by an attendance thereupon, and contributing his mite, gains, as well as imparts, much practical information.

Herein, in part, I have endeavoured to pourtray a *farmer*. The reader may call him a common sense, practical, or scientific farmer; for my part, I think him one who takes an exalted common sense view of his business.—*The Country Gentleman's Magazine.*

FARM MANAGEMENT IN ENGLAND.

A HEAVY clay farm of 133 acres, in Clavering, Essex, abandoned to weeds and neglect, and clover sick, producing but 21 to 32 bushels of wheat, was rented in 1862 by Mr. W. Savill, a schoolmaster of the village, for a period of seventeen years. He put in drains three feet deep, and kept the surface clear of weeds. Commencing with 85 acres of arable land, he has increased his annual tillage since 1867 to one hundred acres, and has steam-plowed an average of 35 acres annually for the past four years. He applies eight loads per acre of farm-yard manure once in three years, and every year gives his crops a top-dressing, costing at least 25 shillings per acre. The result of this treatment is an average of 47 bushels of wheat acre, or 48 bushels of barley. His last crop of wheat after potatoes, was 53½ bushels per acre. He employs five men and five boys regularly, and occasionally five extra men and six to eight girls of thirteen to sixteen years of age.

Professor George H. Cook, of the New Jersey Agricultural College, reports the practice of Robert Leeds, an English farmer of considerable reputation. Mr. Leeds's farm embraces 1,100 acres; 1,000 acres being in active tillage under four-field rotation—roots, wheat, barley, and oats, clover and timothy—the remainder in pasture or permanent meadow. Last year there were 300 acres in beets, ruta-bagas, and turnips, yielding 400 bushels of roots per acre, the whole of which were consumed upon the farm. The stock consists of 2,000 sheep and 150 beeves, besides horses, calves, and pigs. The sheep are chiefly Southdowns, the beeves Durham, all in fine condition. Mr. L. calculates to add $30 to $80 to the value of a steer in eight or nine months. He practices the system of box-feeding. These boxes are about ten feet square, quite high, sheltered, and well-ventilated, in which the steer can turn around and lie or stand at pleasure. The water and food boxes are movable up and down, as in a month after going in they may need to come up a foot to clear the bedding. One box has oil-meal, another cut roots, another hay, and a fourth water. He can help himself at any time, and such generous bedding of clean straw is thrown to him that he eats some of it, while he tramples the remainder and converts it with his droppings into the best of manure. The bullock stays in this box until ready for the knife, and when he comes out, fat, he leaves, perhaps, ten cubic yards of rich compost beneath him. Mr. Leeds sells, annually, 200 to 250 beeves, and 500 sheep.

William Smith, of Woolston, Bucks, reports the cost of steam culture upon his farm in preparation of seed-bed for wheat, barley, oats, and roots. A field of 39 acres of heavy clay land sown to wheat, which is the seventeenth crop under steam culture, cost an average of 4*s.* 7½*d.* A field of 29 acres heavy land which produced a crop of beans in 1870, when the preparation cost 4*s.* 8*d.* per acre, wheat in 1871, at 5*s.* 11½*d.* per acre, has been prepared for beans next year at a cost of 0*s.* 2*d.* The field is not quite clean, but will be so when the beans come off next year. The ridges will be forked and picked this winter at an expense of about 5*s.* per acre. Another field of heavy land, 24 acres, has been prepared for barley next year. The ridges will after picking, as in the preceding case, need splitting by a subsoiler worked by horses in the winter, at a cost of 3*s.* per acre. This, added to the ridging and subsoiling at 0*s.* 2*d.* per acre, makes the total cost of the seed-bed 0*s.* 2*d.* per acre. A field of light land, 14 acres, prepared for barley—the sixth white straw in succession—costs 0*s.* 2*d.* per acre, requiring only ridging and subsoiling. Thirty years ago this field was in grass of the poorest sort, giving a very light produce on an average of years, and when plowed up, twenty to thirty years ago, the yellow clay, which plowed up at not over four inches from the surface, looked like good stuff to adulterate butter with; yet, by the aid of the ridger and subsoiler, this clay has been converted into black mould to the depth of a foot. A lot of 13 acres of light land has been similarly prepared for beans at the same expense, and neither the spade nor plow, worked by man or horse, can equal it in quality at any cost. To steam culture, Mr. Smith attributes his success in keeping his land clean under a yearly system of grain-cropping, and thinks it has much to do in keeping it in condition. His land is not only heavy, but very hilly and uneven, which would need, under horse culture, four good horses to plow three roods per day, and the best farmers cannot, with horses in such land, make a clean seed-bed on an average of years for £1 per acre. He states that his own clay lands did not, under horse culture, produce over 20 bushels of grain per acre, and that the best-farmed land of like kind in the neighbourhood, does not now produce over 24 bushels per acre on an average of years, while his clay land yields an average of 36 bushels. The character of the land has been entirely changed, and his opinion is that clay soils in other districts would change under similar treatment.—*Department of Agriculture, Washington.*

ORANGE CULTURE IN NEW SOUTH WALES.

[BY DR. GEORGE BENNET, F. L. S.]

THE orange is a native of China and India, and is supposed to have been introduced into Italy in the fourteenth century. Gallesio states that oranges were brought by the Arabs from India by two routes—the sweet ones through Persia to Syria, and thence to the shores of Italy and the South of France; and the bitter, called in commerce Seville oranges, by Arabia, Egypt, and the North of Africa, to Spain. Thus, all the old orange groves at Seville planted by the Moors, were the bitter-fruited variety; and the first sweet orange is stated to have been reared at Lisbon, and became commonly known as the Portugal or Lisbon orange. A traveller in Spain, writing of its orange groves, says:—'At Cordova, in the Court of Oranges of the old Moorish mosque, now the cathedral, the splendid avenues of orange trees, all of them centuries old, were a most interesting sight. The lines of the orange trees in the Court corresponded with the lines of the pillars—1,000 in number—in the interior.' He also mentions having visted the Alcazar, the most beautiful of Moorish places:—'Its garden is a marvel of beauty. The most striking thing however, was the celebrated orange tree of vast dimensions, and said to be 600 years old. Its stem is split into several trunks, and covers the ground-space of a good-sized vat.'

The climate of Tasmania and New Zealand is not congenial to the ripening of this fruit in the open air, nor has it yet succeeded to any extent about Victoria. For this reason, a large and remunerative trade is carried on by the exportation of oranges from New South Wales to the less-favoured colonies. The whole of the citron tribe are evergreens, and therefore are ornamental as well as useful. The gardens about Sydney are all well-planted with orange trees; and during the summer season the effect produced on the eye by the blossoms and fruit, in every stage of maturity, is beautiful in the extreme. This fact of the orange tree bearing flowers and fruit at the same time has been alluded to by Moore:—

> 'Just there beneath some orange trees,
> Whose fruit and blossoms in the breeze
> Were wantoning together free,
> Like age at play with infancy.'

One thing remarkable in the citron family is that, although a tropical genus, it ripens its fruit in all countries in which it becomes naturalized only in the winter months; and from this peculiarity it has probably been enabled to travel from India to the southern shores of Europe, and to find a congenial locality in the equable and temperate climate of the Azores, Cape of Good Hope, and New South Wales. The varieties of the citron family thrive in great luxuriance in the open air in the districts around Sydney, Hunter's River, and other suitable portions of the colony of New South Wales, more especially in sheltered situations in the vicinity of the inland creeks or salt water rivers (as they are termed by the colonists), such as the Paramatta, the Hunter, and others. In localities of this description, fine healthy, umbrageous orange trees are planted in groves, their dark green glossy foliage contrasting beautifully with the clusters of delicate white, waxy-looking flowers, which diffuse a rich fragrance in the surrounding atmosphere, and attract by their perfume innumerable swarms of bees, butterflies, and other insects; while at the same time, the fruit may be seen in every stage of ripening. It has always been found that lemon and orange trees thrive luxuriously on a sloping ground, in sheltered situations, near the salt water, or under the influence of the sea air, yet not exposed to the sea breeze. They always grow best, too, where they can enjoy the genial warmth of the morning sun.

The orange tree was first introduced into Sydney, New South Wales, from Brazil in 1788. Captain Hunter says, in his 'Journal of Transactions at Port Jackson and Norfolk Island,' that they took on board at Rio de Janeiro, among other seeds and plants, 'orange, lime, and lemon trees;' and further states that, at Sydney, 'vines, orange, and lemon trees are in a very thriving state.' These were introduced from Sydney into Norfolk Island, where Lieut. King observes, in his Journal of 1788 at that Island—'Two orange trees which I brought with me (from Sydney) were kept in tubs until I should find a sheltered situation to plant them in.' He afterwards says they were planted in the vale; and in March 1790, observes—'Vines, orange, and lemon trees are in a very thriving state.' Thus we find that they appear to be well-established in Norfolk Island: and at this time they were also thriving at Sydney, as we learn from Phillip's 'New South Wales,' in 1790. From this date, therefore, the cultivation of the orange trees in this colony may be considered permanent. A curious fate, however, overtook the orange trees in Norfolk Island. Norfolk Island was formerly covered with orange trees. But the commandant, in 1827, believing that the fruit furnished means of sustenance to the runaway convicts, caused them to be destroyed almost to a tree.

In 1844 there was but one tree upon the Island, and that was in an unhealthy state.

In New South Wales, the most luxuriant orange crops are produced on a slightly sloping land with an eastern aspect. By this position a good drainage is secured, and, great care and attention being bestowed upon the plantation, a superior quality of fruit is ensured. We, perhaps, could not give our readers a better idea of Australian orange growing than by quoting the following description of a visit made in 1850 to one of the largest orangeries in New South Wales, at a place called Lane Cove:—

'After an agreeable drive of nine miles, I arrived at the orangery. On entering the grounds, the scene was beautiful. It is impossible to describe the effect produced by the mass of bright foliage, studded in all directions with golden, luscious fruit, and redolent with the perfume of the flowers—realizing what Thomson, in his 'Summer' says:—

> 'Bear me, Pomona, to thy citron groves;
> To where the lemon and the piercing lime,
> With the deep orange glowing through the green,
> Their lighter glories blend.'

'The situation of the grounds is good, having a north-east aspect, and sheltered from the inclement winds. The land is well-drained, and gradually slopes to a well-watered creek; and on the opposite side of this, gradually rises again. On the brows of these sheltered hills the rows of orange trees are planted. At the entrance of the garden I remarked some fine lemon trees, forming an agreeable contrast, by the lighter green of their leaves and the delicate hue of the pendulous clusters of fruit, with the darker tints of the orange trees in their vicinity. The fragrance of the blossoms attracted multitudes of insects, butterflies of various bright tints, and innumerable bees—the latter imbibing the nectar from the flowers to convey to their hives, kept upon the grounds of this plantation. What a combination of beauty this scene displayed! What gratification it afforded to the senses! The air we breathed was filled with delicious odour, and the trees around were loaded with ripe and ripening fruit. The mandarin orange trees are readily distinguished by the smaller leaf; and I observed that the fruit on the upper branches had attained a large size, whilst those on the lower branches were much smaller. These oranges, in Egypt and other countries, when budded on the Seville orange stock, form quick-growing and fine trees; but when budded on the shaddock, as recommended by others, bear a fruit of very superior flavour.

'The mandarin orange trees, several of which in this plantation were twenty feet high and forty feet in the circumference of their leafy branches, have yielded annually 350 dozen each tree, and the more common varieties have produced 250 dozen. The trees in this plantation, numbering nearly 400, surprised me by their healthy, luxuriant growth; and the absence of weeds evinced the great care bestowed upon them. Every two years the earth was dug around the trees, which, by admitting air to the roots and by occasionally manuring with bone-dust and other fertilizing agents, materially benefited their growth and productiveness. The trenching was carried from twenty inches to two feet in depth, which was always found amply sufficient. Bone manure is considered effective on clayey and sandy soils, and the benefit is felt for many years. Some of the finest and most productive orange trees have been grown near the Salt water Creek, the subsoil consisting for the most part of shells, and among swamp oaks (*Casuarina*).

'The aborigines name the casuarina *she-oak*, which has probably been corrupted by the early settlers into 'she-oak.' Another valuable variety in this orangery was the naval orange—a fine, large, and luscious fruit—originally from the Brazils. It is devoid of seeds, or has, at most, a solitary one, which is always abortive. This is a highly-valued variety, but is usually regarded as a precarious and shy bearing tree; and each usually bears only about 100 dozen. The crop of naval oranges is also very uncertain, the blossoms not being able to endure the hot winds so well as other varieties, and a large portion is often destroyed. Nevertheless, from their extended cultivation, a great number of these delicious oranges are sold during the season, and as they obtain a higher price in the market than others, it compensates the growers for their more limited production. The extent of ground planted with oranges at this place was twenty-two acres, the trees being about twenty-three feet apart. Many of them were from eighteen feet to twenty-five feet high; the latter, when measured, had a circumference of branches of fifty-four feet.

It was a bright sunny day, when this orangery was visited, with an exquisite, clear Australian sky, and the light was playing over the plantation with a brilliancy and beauty that must have aroused the most apathetic to admiration of the luxuriant scene. Here, also, is grown the Bergamot lemon—a hardy and prolific variety. Both flowers and fruit possess a powerful fragrance, and from both an essence of a delightful odour is extracted. It is said that 2½ ounces of the oil, by expression, is produced from 100 lemons.

The orange tree generally begins to bear about the third or fourth year; but growers seldom or never permit the fruits to come to maturity until the fifth or even the seventh or eighth year, by which time the tree has attained a considerable size, has more vigour, and will then probably, with care and attention, bear fruit to the age of sixty or seventy years, and even more. Most orange growers have a habit of planting the trees too close together. But this is a great mistake. There is not a tree that exhausts the soil more rapidly than the orange; and thus, when there is not a fair distance between orange trees at the planting, one is apt in time to destroy the other. It is a common saying in orange growing districts, that 'the greatest enemy to the orange tree is its own kind.'

In the Hunter River district there are several fine orangeries. One of the finest is a Mr. Waddell's, at Townhead, Singleton. It covers upwards of four acres of land, and numbers four hundred trees, the oldest of which were planted ten years ago. The trees were selected with the greatest care, Mr. Waddell having more regard to the quality of his fruit than to mere quantity. The Seville at St. Michael, so justly celebrated, grow here in perfection. One tree alone in this orangery has averaged a yearly yield of 100 dozen oranges during the last four years. But every tree is equally prolific; so that, in a good harvest, the four hundred trees yield a crop of something like 480,000 oranges. The orchard is kept in the highest order, and is laid out in great taste. The long avenues of trees with the deep green leaves when the fruit is ripe, have a lovely appearance. So umbrageous, too, are these trees, that it is deliciously cool in the orangery in the hot days of summer.

Near Paramatta, and in other districts of the colony, there are extensive gardens of oranges, and other fruit trees. Here oranges, lemons, apples, pears, loquats, apricots, peaches, and other excellent fruits, together with extensive vineyards, stocked with superior kinds of grapes, may be seen growing in the greatest luxuriance.

The orange in New South Wales often grows to a very large size. Some naval oranges, taken from five year old trees and grafted on seedlings, were exhibited very recently in the Sydney market, and were found to weigh respectively 22, 22¾, and 25½ ounces. Two common oranges on a single stalk weighed together thirty-two ounces. Some large specimens of the Emperor Mandarin orange, exhibited at the same time, bore good witness to the suitability of the climate for orange culture.

As the orange tree increases in age, so the fruit improves in quality—that is, if it is originally a healthy tree and grafted on a good stock; the younger trees bearing fruit with a thicker rind and abundance of seeds. As the tree becomes older, the skin becomes thinner, the fruit much more juicy, and the seeds diminish in number. As a rule, the older the tree, the thinner is the skin and the more luscious the flavour of the fruit. Some of the trees at the Azores bear at a very great age. It is no uncommon thing to see a tree a hundred years old still bearing plentifully a highly-prized thin-skinned orange, full of juice, and free from pips. In New South Wales the orange trees commence bearing ripe fruit about the month of June. They are at that time of an acid flavour, but are sweeter in July; and from September to January they are in perfection. The season seldom terminates until February, and even as late as the 15th of March oranges are occasionally exposed for sale. It is found in New South Wales that if oranges are allowed to remain on the trees, and only plucked as required, they last all the year round—or, at all events, until the next crop begins to ripen. The late blossoms form a second crop, which, ripening later in the season, keep up a supply for the table; but oranges left too long upon the tree in any quantity are liable to injure the fruit of next season. Those of the second crop are small, with the pulp peculiarly crisp and sweet, containing, if any, very abortive seeds. Sometimes the rind remains green, or is of a pale yellowish-green colour.

Mention has just been made of the seeds of the orange. All the species of the citron family may be propagated by seeds, grafting, budding, or layers. The plants raised from seed are generally used for grafting and budding, as they are considered to possess greater durability and productiveness. The fruit is sweeter, but they take a longer time to come into bearing. The best month for pruning orange trees in New South Wales is February; and by keeping the branches thin, so as to admit sun and air, improves the quality of the fruit; for in unpruned, or in trees too much sheltered, it has been found that the rind of the fruit has become thicker and softer, which is prejudicial to the keeping of the fruit. By judicious pruning, the health and graceful appearance of the tree is much improved, and when it is borne in mind that the blossoms of the citron tribe are produced in the form of terminating peduncles on the wood of the current year, the object of pruning ought to be to encourage the production of young wood in every part of the tree. The wood of the citron tribe is hard, compact, and durable. This family is remarkable for the dotted appearance of all parts of the plants, in consequence of their abounding in little cells filled with a volatile and frequently highly fragrant oil. For instance, on holding up the foliage of the orange tree to the light, it is observed to be covered with innumerable minute glands, which secrete an essential oil in large quantities.

Efforts are being made in the colony to make this oil together with water distilled from the flowers, a valuable article of commerce, as it has been in France and the southern parts of Europe.

The flowers of the orange have somewhat of a warm and bitter

aromatic taste, and are not only held in high esteem as a perfume, but are used for making orange flower water, as they give out their flavour by infusion. This preparation is extensively used, more particularly among the French, for nervous and hysterical complaints.

The Chinese scent their teas with orange flowers. The method has been thus described :—'In a corner of the building there lay a large heap of orange flowers, which filled the air with the most delicious perfume. A man was engaged in sifting them to get out the stamens and other smaller portions of the flower. This process was necessary in order that the flowers might be readily sifted out of the tea after the scenting had been accomplished. The orange flowers being fully expanded, the large petals were easily separated from the stamens and smaller ones. In 100 parts, seventy per cent. were used and twenty thrown away. When the orange is used, its flowers must be fully expanded in order to bring out the scent. When the flowers had been sifted over in the manner described, they were ready for use. In the meantime, the tea to be scented had been carefully manipulated, and appeared pefectly dried and finished. At this stage of the process, it is worthy of observing that, while the tea was perfectly dry, the orange flowers were just as they had been gathered from the trees. Large quantities of the tea were now mixed up with the flowers in the proportion of forty pounds of flowers to 100 pounds of tea.

'This *dry tea* and the *cinched flowers* were allowed to be mixed together for the space of twenty-four hours. At the end of this time the flowers were sifted out of the tea, and, by the repeated sifting and winnowing process, which the tea had afterwards to undergo, they were nearly all *got rid of*.'

The flowers of the Seville orange yield a very delicious water and essential oil, which are much patronized by the Egyptian ladies.

Piesse says in his work on the art of perfumery :—'Some plants yield more than one odour, which are quite distinct and characteristic. The orange tree, for instance, gives three—from the leaves, one called *petit grain*; from the flowers we procure *neroli*; and from the rind of the fruit essential oil of orange, *essence of Portugal*. On this account, perhaps this tree is the most valuable of all to the operative perfumer.'

An important question has been agitating the minds of the orange growers of New South Wales, whether as extensive flower farms may not be established in the colony in the course of a few years as flourish in a similar climate at Nice, Grasse, and Cannes, in France.

Some idea of the commercial importance of the flower-growing trade may be formed, when it is said that one of the large perfumers of Grasse and Paris employs annually 80,000 lbs. of orange flowers, 60,000 lbs. of cassia flowers, 54,000 lbs. of rose leaves, 32,000 lbs. of jasmine blossoms, 32,000 lbs. of violets, 20,000 lbs. of tuberoses, 10,000 lbs. of lilac; besides rosemary, mint, thyme, lemon, citron, and other odorous plants in large proportion.

Surely these facts are sufficiently encouraging to the enterprise of Australian orange farmers, proving as they do that a rich source of wealth to the colony yet remains unopened and neglected.—*Once a Week.*

FLAX CULTIVATION.

(BY SEPTIMUS V. PRIOR.)

I BEG to submit a few of the most important matters to be observed in the management of a flax crop, which I have endeavoured to condense from "Warne's Treatise on the Flax Crop," a Book of instructions on the various Belgian methods of growing and preparing flax, compiled by E. F. Demun, late instructor to the Royal Flax Society in Ireland; instructions compiled by the Flax Association of Belfast; Extract from an article published in the "Transactions of the Royal Agricultural Society of England, vol. xiv;" and "The Flax Movement," by Chevalier Claussen, to all of which works I would direct those who wish for further information upon this interesting subject.

Soil.—On this point there is a diversity of opinion. It seems natural enough to expect the best crop from the strongest soils, but this is not found the case in practice, a soil of moderate strengthening preferable. The reason is apparent, when it is remembered that a strong straw yields a coarse and less tenacious fibre than a fine slim one. The best soils are an alluvial or a light sandy loam, well-drained, level, and easy to be worked. It has been proved in this colony that flax of excellent growth has been obtained on land said to be exhausted for the production of wheat. Hilly land should be avoided, as it cannot produce a uniform height of straw, which is a most essential matter.

Quantity and rotation.—It has been found injurious for two crops of flax to succeed one another. Let the quantity under flax be so arranged that the same land does not come under flax oftener than once, at any rate, in three years. In localities where flax could be grown in this colony, it would make an excellent leading crop to lay down English grass or clover—a system of agriculture highly to be desired. But even in those districts where peas are so extensively grown, they might the same season follow a crop of flax, and thus two crops could be obtained in the one season without detriment to the growth of wheat the following season. On the contrary, as both these crops are by their chemical relationship excellent restoratives of the ingredients required in the growth of wheat, there would be a greater probability of an excellent crop of wheat by following such a rotation.

The following table will explain my meaning more clearly, and will show at one glance the component parts of the inorganic matter of 100,000 parts of wheat and wheat straw, linseed, and flax straw, and peas and pea straw respectively :—

	Wheat.	*Linseed and Flax.*	*Peas and Straw.*
Silica	3·270	·140	1·406
Magnesia	·722	·214	·478
Lime	·598	·890	2·788
Soda	·269	·485	·739
Potash	·245	·463	1·045
Phosphoric acid	·201	·998	·430
Other ingredients	·252	·156	·549
Total, inorganic matter	5·295	3·746	7·435

100,000 parts of a rich alluvial soil should contain the proportion of ingredients shown in the following table :—

Silica	64·800	Alumina	5·700
Magnesia	84	Oxide of Iron	6·100
Lime	0·880	Humic acid	2·540
Soda	·363	Nitrogenous matter	1·582
Potash	·210	Water	1·504
Phosphoric acid	4·30	Other ingredients	4·421
Humus	5·690		

Thus the very refuse of flax and peas is the life of wheat, and the idea of the exhaustive properties of a flax crop is satisfactorily refuted.

Preparation of the Land.—Stubble-land intended for flax should be ploughed deep in the autumn. If light allow it to remain until seed time; medium may require a second ploughing, which should be done not less than two months before sowing, to get it into good condition. Don't plough deeper than three or four inches the second time. If it is very necessary to remove any weeds which may spring before sowing, then harrow fine. If it is possible let the land for flax be without ridges, as the straw on the ridge will be coarser than that in the centre; in this case cross harrow only; if in ridge, up and down only. Roll lightly before sowing the seed if the weather is dry, care being taken not to set the soil. Only where the soil is very light is it desirable to roll after sowing. Pulverizing light soils to a great depth in a climate like this would be a very great mistake, it only being requisite to obtain an even well-worked bed for the seed to germinate in.

Sowing.—If the ground has been rolled, give it a single stroke with a light seed harrow; but some prefer sowing on the rolled surface, and in this climate it would certainly be advisable. Flat ground should be sufficiently marked in lands to guide the sower. The time must be decided by the climatic position. It is advisable not to sow too early, lest the spring frost should stunt the plant and induce it to branch—one of the greatest misfortunes which can befall the crop. The crop comes to maturity in about 10 weeks. Two bushels to the acre is the usual quantity adopted; but if an error has to be made, prefer to sow too thick rather than too thin. Before sowing try 100 seeds to a flower-pot, and water them to induce speedy growth. You will thus obtain the best test of the vitality of the seed. It has been proved that some of the finest flax has been produced from home-grown seed, but care should be taken to change it often, the same as an ordinarily careful farmer will the seeds of other grain. Avoid sowing seed of the last year's growth; it is preferable to have it older. If imported seed is used, the Riga is the best adapted to the soils of this colony, although the Dutch gives better fibre, and is more free from seeds of weeds. Before sowing riddle the seed through a sieve made of perforated zinc, to cleanse from impurities, and when sown give it two strokes with a seed harrow. Ground to be laid with English grass should be sown immediately after the flax, and before it is harrowed, but on no account sow Italian ryegrass with flax; if it is required sow after the flax crop is pulled, choosing a wet day. If dry, roll at once across the field, not up and down. The best prospect of a good crop of flax is when rain falls immediately after it is sown, but on no account roll a flax crop after it has appeared above ground. If a few patches occur, sow them over again, choosing a wet day. A little liquid manure would be of great service in such cases.

Weeding.—I have lately been informed by a farmer at Macclesfield that he sowed a small patch as an experiment upon a piece of land overrun with sorrel—the greatest pest of the district—and he not only had as good a show of straw as that grown at Gumeracha, but it entirely eradicated the sorrel also. If weeding must be done, do not let the crop attain a greater height than about three inches before it is accomplished, and observe the greatest care that those employed do not wear heavy boots. Their feet should be wrapped in bagging and carefully tread amidst the plants, taking particular care not to turn on the toe or heel, but to tread evenly and flatly on the young and tender plants. Choose a

damp day for this purpose, and on no account weed if the ground is not sufficiently moist to stand the loosening it will occasion around the roots of the tender plants; rather leave the crop unweeded.

Pulling.—Great care is requisite at this stage of the crop, both in the judgment of the right time to pull, as in the manner of doing so. Several opinions exist as to the most profitable system of pulling whether it should be done when green, or when quite ripe. Some prefer pulling it in sacrificing the seed, for the finest fibre is generally obtained when the flax-seed has not ripened. But so far as the first introduction of this product is advocated, it will be advisable to adhere to the plan most sure to return a profit —this is by pulling when the seed is quite ripe. For this purpose, watch the crop until the stalk near the ground becomes a pale yellow, and the leaves fall off eight or ten inches from the ground. The top seed-bolls, or heads, will also assume a slight brownish tinge. Care should be taken in pulling to separate the short from the long straw, by pulling them alternately. This can be accomplished by placing the hand just under the seed-bolls to pull the long straw, which leaves the shorter straw for the next pulling. They should be laid down separately, and so kept separate throughout all the future process. The following are four systems of pulling:—1. The flax is pulled, and in a few hours steeped with the seed. 2. The bolls are rippled (divested of the seed) in the field, and the straw steeped immediately. 3. The flax is dried in stooks, seed thrashed, and straw steeped. 4. Stooked stacked, and the seed beetled (thrashed out) in the winter months. The fibre in Nos. 1 and 2 will be found equal in value, and both superior to 3 and 4; but taking the seed into account, either of the three latter will be more remunerative than the first, and the last most of all, whether as regards the arrable value of the crop, the advantage of the seed, or the employment afforded where labour is abundant. In every case care should be taken to keep the butt or root ends even, and to avoid entangling the seed-bolls, and to lay down in such moderately-sized handfuls as can be easily handled.

Rippling or Removing the seed.—Where the straw will be immediately watered, this must be done so soon as the heads are sufficiently dry to yield up their seed. Many methods will occur to any ingenious farmer for obtaining the seed, the only care being required not to disarrange the bundles or "beets," or to bruise the head of the straw, or to make the root-ends uneven. The following system has been found to answer admirably in Tasmania:—Two wooden thrashing-floors are erected on four wooden wheels, high enough to carry the floor clear of the ground. This is drawn between the rows of bundles or sheaves by a horse. Two men, one on each side, place a row of bundles on the floor—seed ends inwards, the root ends projecting over the sides, so as to prevent any dirt mixing with the seed. The seed is then "beetled" out of the heads by means of a wooden mallet—in a few minutes the work is done. Then tighten the band, and re-stook. Opportunities of carrying the seed home will readily suggest themselves. There is one item which should not be lost sight of, and that is the saving of the husks and faulty seeds of the flax, both being an excellent food for any stock; besides which the seeds themselves in their best quality, crushed with barley, make the most excellent horse provender.

Dams and Watering.—Until the cultivation of flax has attained satisfactory permanency amongst the productions of the farm, it cannot be expected that any system of "retting" will be adopted other than that which I trust before many years have elapsed, will, in those countries where flax cultivation is largely undertaken, be classed amongst the primitive and old-fashioned. This I will describe immediately, but I desire to call the attention of those who have any idea of undertaking this cultivation for a permanency to the following system which has been found to work oeconomically with great expedition and complete success, besides being able to utilise every particle of the waste water as a very nutritious food for cattle, pigs, &c. The process is thus described in the Journal of the Royal Agricultural Society of Great Britain:—The whole arrangements required are inexpensive and occupy but little space. The straw is placed in a steam-tight chamber of a suitable size and shape, the tow being formed by an iron tank containing cold water, and the lower end having a perforated false bottom about 12 inches from the other. Steam at a low pressure is then driven from the boiler through a pipe into the chamber, and passing up through the straw comes in contact with the iron top, by which it is condensed, then trickling down the spikes fixed there as points of dispersion through the mass, it passes through the false bottom, carrying with it the extracted matter thus dissolved out of the straw, the whole process only occupying from 10 to 12 hours. The straw is then removed and is passed through four sets of smooth rollers, which squeeze out about 60 per cent. of the refuse, besides breaking up the central woody core or "shove," and materially assisting its subsequent separation from the fibre. From these rollers it is carried to the drying house, which is heated by steam-pipes from the boiler, and thence to the scutching frames, where the operation is performed more rapidly and efficiently than when the flax is prepared by the ordinary method, owing to the thoroughly crushed state in which it comes from the rollers. The flax is then ready for market, having passed through the whole process, from the raw material to the prepared fibre, in the short space of about 36 hours. The following are a few of the advantages recommending this process:—Great saving in time, economy of fibre, avoidance of any nuisance, and beneficial application of waste products. As a food for cows or pigs the steep liquor has been found by chemical analysis to contain very nutritive properties, fully equal to distillers' wash, and when poured over the husks of the seed or chaff, it was readily consumed by cows or pigs, who appeared to thrive on it without any purgative effects being noticed. In a climate where the odours necessarily arising from the commonly-adopted system of dams and open-air steeping might probably be followed by serious consequences to the health of the community in the vicinity of those operations, too careful attention cannot be devoted to any new inexpensive system of avoiding any possibility of such a calamity happening, and any discovery in this direction would well merit the recognition of a Government reward. I was desirous of directing attention to this question in this place, as in a question of first expense it might recommend itself to some who may adopt the system so recommended, that whilst they were making pits, dams, &c., according to the old system, a few pounds extra would establish a system more efficacious and expeditious, producing flax at a less expense, of a more valuable quality, and turning to account that which by the other system pollutes the air, and at best is only available as manure for the farm.

Before describing the old process, as at present in use in the flax-growing countries, I cannot too forcibly urge upon those who may undertake this branch of industry to give my recommendations their careful consideration, for experiments in this process are at present commanding considerable attention.

Dams and Watering.—According to the old system, the dams should be made long before they are required, and dug out of clay, if possible. A number of moderate-sized dams are preferable to a few large ones. Nine to twelve feet broad and four feet deep are about the usual dimensions. Choose a sheltered situation, and an aspect exposed to the sun, and ensure from leaking, as flax water will penetrate through substances that would return clean water. A dam of fifty feet in length, nine broad, and four deep, is estimated to contain the produce of an acre of an average crop. If possible, choose a site that would enable the water to be drawn off, and never use the same water twice, and be careful to steep each day's pulling separately. The presence of lime is the chief obstacle to be avoided in the choice of water for steeping. Iron is not so much to be feared, but care is requisite in choosing both the water and the site for the steeping-pit.

Retting or Watering.—This is probably the most delicate point in the whole process. The "beets" are carried to the dam, and beginning at one end are placed in rows close together side by side, with the root end down. In commencing the next row place the top of the beet upon the strap of the first row, and go on until the pit is full, they are then weighted down by means of poles and logs. Some use stones and sods. For this purpose the following plan has been successfully adopted in Tasmania:—Along the side of the pits are placed upright posts about seven feet apart, then a number of spars, the width of the dam are placed upon the top of the flax, and on the top of these, and close against the upright posts are placed a number of spars equal to the length of the dam. In the upright posts a few auger holes have been previously bored, in which to fix a peg above the cross-spar, so that the whole mass may be held at any requisite distance under the water—generally about two or three inches, but not so as to allow the flax to touch the bottom, which would be very injurious. By this means the rolling of heavy pieces of timber, carting stones, or cutting sods for the purpose of keeping the flax under water is avoided, and the poles will remain for use for succeeding years. The sooner fermentation commences the better. If the weather is warm it will set in in a few hours, when the water will become red, and in twenty-four hours will turn quite black. The water then becomes covered with bubbles, and the process will now go on more or less rapidly according to the temperature of the atmosphere. When nearly ready to be taken out, fermentation ceases; the mass spontaneously leaves the transverse poles and sinks to the bottom of the pond. It is at this stage that much judgment is requisite to know the exact time at which the flax should be taken out. Experience alone will teach this, and it is in this also that the steaming process before-recommended, offers additional advantages, as by that process the stages of maturity are more easily discerned. In this process from 12 to 14 days is the usual time allowed at home, but in this mild temperature a much less time say 8 to 10 days, would be ample. A good test of fitness to "lift" the flax is to take out a beet or two in different parts of the dam, open and examine them. If it seems soft in the hand it is nearly ready; then take three or four reeds, which will be covered with a greenish slimy substance, and if this can be removed from surface by passing it delicately through the finger and thumb, it is most reliable proof that it is fit to remove from the pit. The Belgium test is to bend the reeds gently over the forefinger, and should the woody part separate freely from the fibre and start up, it is time to throw out.

Examine both coarse and fine reeds, so that an average may be obtained, as the coarse will water more readily than the fine. Flax is generally not sufficiently watered, and an error in watering too much is one on the right side. When ready to lift, it is thrown on the bank and allowed to drain for an hour or so, and then carried on hurdles to grass.

Grassing.—Stunted pasture or a plot of lucerne or clover, sown for the purpose, are the most desirable sites. Any weeds should be mowed down. Place the beets at convenient distances for the spreaders, who should shake out in thin and even rows across the field, letting the top of each row lap the top of the preceding one about two inches. When the fibre contracts and leaves the core, and forms as it were a string, then if on a slight rubbing the woody core breaks off, leaving the fibre entirely free, the flax is ready to lift. Never take flax off the grass on a wet day or if it is any way damp. Keep the butts even and lay down in bundles sufficient to make small beets. Tie moderately firmly. Stook for a day or so, and then rick, or carry to the scutching mill. The stacks should be upon concreted foundations or piles above the ground, to avoid damp or the ravages of vermin. The roof should be of straw, very perfectly done, to avoid any chance of damp stains, and the stacks should be round, butt ends outward, to avoid any chance of discoloration from the sun.

HODGE IN ARMS.

THERE is an item of news contained in the Special Telegrams we publish this morning, the importance of which can scarcely be overrated. The tremendous social movement of Trades' Unions, which has of late years drawn so much attention and exercised so much power over the labouring classes in England, is daily and hourly increasing in strength. Its first rise was manifested in the wide propagation of a theory amongst artizans that the employed should always have a certain share in the profits of the employer. This was a vague theory at first, but it was one so nearly touching the interests of a vast mass of the lower orders of Englishmen, and one which contained in it the germs of a self-evident truth, that it speedily began to be acted upon. It then broadened into the question of the general rights of those employed. If the employed could not wrench a part of the monetary profits which their labour brought to the employer, then they would take it out in something else. They would not slave so hard. Their repayment should be less work, and more leisure. They would shorten the hours of their diurnal toil. Time should be to them equivalent to the result of wealth. Instead of working twelve hours they would work ten or nine a day. The employer would lose the money equivalent of these two or three lost hours, but the workmen would gain that leisure which in a sense, was equivalent to them to money. At first the best and most skilled class of artizans adopted these principles. Union was their only strength. They saw this, and thus arose associations of the poor many against the wealthy few, entitled Trades' Unions. After one or two strikes, it was seen that a tremendously powerful engine had been set to work—that poor men could successfully oppose the rich, if only they stuck together with perfect unanimity. The newly-awakened power struck terror into employers, everywhere Trades' Unions began to rise. The war cry of everyone of these associations was for shorter hours of labour and higher rates of pay for that labour. The movement, contrary to the course of popular movements in general, spread downwards. Beginning at the highest class of artizans, it has now, as we see from the telegram before us, reached the very lowest class of workmen, the poor ignorant agricultural labourer. We hear that not only amongst these has a combination been effected, but that it is extending rapidly. The members of the vast network of Trades' Unions throughout England are assisting the new malcontents actively. The land-owners and farmers are being infected with alarm. The whole movement, to quote the words of the telegram, is "assuming national importance!"

The question which affects capitalist and labourer reciprocally is one of enormous importance and enormous difficulty. Both classes, the employers and the employed, have their distinct rights. The prerogatives of neither of these sections of the community ought to be interfered with, whilst masters and men honestly strive to succeed each in their own way to the best of their ability. To do this, the employer must get as much work as he can out of his employés. But the employé, to succeed, must get high wages for as little work as possible. As long as an employer had his pick and choice out of a number of labourers, he was likely to take undue advantage, and grind down his workmen to low wages, and very lengthened hours of work. Now the tide has turned, and the fear is that the employed, uniting together, will obtain too much power and give the employer his choice between ruin and very partial success. They may now say to him,—you must give us wages that you can scarcely afford for but little work on our part, or we will strike work: you can't get other workmen to supply our places, and you will be ruined. Such is one phase of complication. We need but cursorily refer to another phase of the same complication. A part of the whole body of the employed may think that, for a certain scale of wages, they should only work so many hours—say, eight. Another part may say, No, we will work nine, eight is too little, it is unjust to the empoyer although it benefits us,—and upon the employer granting nine hours a day as the minimum work required, this latter portion of the workmen assemble to work. The other half now take umbrage, and strive to prevent those willing to work from working. And often a sad scene occurs, of bickering, and probably bloodshed also. There is also another sad phase in the Trades' Union movement. Some workmen objecting to the latent element of force in it, and perfectly contented with their employers, refuse to join it. Then the tactics of the members of the Trades' Union, in too many instances, is to force their recalcitrant workmen to join their organization, and if those workmen refuse, to injure them in some way. But it is indubitably right, in the main, that the labourer should improve in his status, whilst his employer, through his labour, is rising to prosperity. He is quite right in endeavouring to improve himself thus, and therefore, if he finds a union of his fellows is the only way of accomplishing the end he aims at, he is not wrong in joining a Trades' Union. There is therefore a great deal to be said on behalf of these very combinations of workmen, through which combinations, however, many undoubtedly great evils have from time to time arisen.

We now hear that this movement has reached a class of workmen whom we never supposed it would have reached in so short a time. The agricultural labourer is generally speaking an ignorant stolid man, who has never been to school, who wields his scythe or guides his plough more like a machine than a man. He knows almost nothing of English civilization He does not mix much with other than his fellows, except when he drinks ale or cider at the bar of a village inn, or attends a neighbouring fair with a foolish decoration of ribbons in his hat. The community, too, of agricultural labourers is one of the most scattered in England. To have got up anything like a combination amongst these poverty-stricken rustics seems a miracle. Yet we are not sorry that it is so. Whilst we often regret to see the hold which Trades' Unions have over respectable and well-paid artizans, forcing them into acts at once unpatriotically inimical to their employers, and suicidal as far as regards themselves, we are heartily glad to see that the poor ignorant hard-working down-trodden agricultural labourer is being shown the way how to assert himself, and better his position. Nothing but national good can result from the amelioration of the condition of those the lowest of the labouring classes. We wish poor HODGE good speed, now he is up in arms.—*Madras Times.*

HODGE IN ARMS.

To the Editor of the Madras Times.

SIR,—In this morning's issue of the *Times* under the heading—Hodge in Arms—you have, I regret to say, fallen into rather a serious error, as to the position of the agricultural labourers now on strike in the North of England: these men are far from being the poor ignorant hard-working down-trodden agricultural labourers you imagine; that they are ignorant, I will admit—the present agitation proves this—but they are certainly *not* ignorant, in the ordinary sense in which the word is used; most, if not all, are able to read and write, having attended school until 12 or 13 years old. On many North Country Farms, it is usual for the labourers to club together, and subscribe for a daily newspaper; indeed, some go further, and subscribe for a Weekly Paper for their *own* use. What higher evidence could I give you, Mr. Editor, of their civilization!

They take a keen and intelligent interest in the politics of the day. Let me advise you, when next you take a holiday to England, to take a fishing rod, and spend a few weeks in Coquetdale, Tweedside, along the banks of the Alne, North Tyne, the Wansbeck, and up near the sources of the Tyne, and Weir, in the district to which the strike is as yet confined; enter freely into conversation with the field labourers you may meet, and I am sure you will not continue to believe that our north country labourers are the poor ignorant beings you assert; you will be surprised to find what a very intelligent knowledge they possess of passing events.

I assert most unhesitatingly that the agricultural labourers, now on strike, are as well-paid as any class of labourers in any part of England. Over the whole district, average labourers are paid 16 shillings weekly, besides each man has an allowance of 1,000 yards of potatoe drill for cropping, that is, the farmer prepares at his own expense 1,000 yards of drill for potatoes, doing all the cultivation and giving the land for the season, free of rent; the labourer finding seed and manure. The return of this land is generally 1½ tons of potatoes, worth, in an average season, £7; deduct from this, the value of seed and manure (£1), and there remains £6, the labourer's profit. The farmer carts, free of costs, all the coals the labourer requires; this is worth at the least £2 a year all; such labourers are provided with cottage and garden (¼ acre) free of rent. This privilege is worth at the least £5 a year; and there are many other advantages the labourer enjoys, difficult to value;

[illegible] is allowed to [illegible] a pig for his own use, partly with the produce, and partly with inferior corn, sold to him at a low price; besides, he is always allowed to buy on the farm all [illegible], when, [illegible], at [illegible] rates, and pay at [illegible] and last, but not least, he receives his pay—all the year from January to December, whether he is working, or ill, or whether the farmer has work, or not, it being usual over the district in question, to engage under yearly agreements. It thus appears that an average labourer is paid as below :—

	Yearly. £	s.	d.
Wages 14 shillings weekly	41	12	0
Pasture ground	6	0	0
Carting coals	2	0	0
Cottage and garden	5	0	0
	54	12	0

or $1 1s. per week.

The average earnings of skilled Mechanics in Newcastle, Sunderland, Shields, and the other large towns in the district in which the strike prevails, are 2 shillings; but time lost in sickness must be deducted, or a payment of 2 or 3 shillings weekly must be made to a number of Benefit Societies to ensure *full* wages *throughout* the year. Thus, as far as money income is concerned the positions of the two classes are equal; while in other respects, the lot of the agricultural labourer is immeasurably superior, as he enjoys many advantages unknown to his town brother, while his 21 shillings will in the country go much further in buying the necessaries of life.

At a meeting of delegates from the agricultural districts, held at Newcastle on the 11th March last, it was resolved that work should always commence at 7 in the morning. That one hour should be allowed for dinner. That work should cease at 5 in the evening. That a half holiday should be given on every alternate Saturday. That Sunday labour, in attending live-stock, should be specially paid for. That all overtime in feeding live-stock at night and morning should be paid for at the rate of six pence per hour, and, though no resolution was passed on the subject, the majority of the delegates agreed in demanding under the new arrangement 20 *shillings per week, money allowance, and the perquisites now enjoyed.* Had the agitation commenced in Ireland, or in the south of England, it would have had the best wishes of the majority of our farmers, as it might ultimately produce something like an equilibrium in our supply of labour, removing the superfluity in some districts; and, supplying the deficiency in others. It is a great mistake to suppose that *low priced* labour is *cheap* labour. I have been connected with the management of estates in Northumberland, on which labourers were paid at the rate of 20 shillings a week; in Essex and Gloucestershire where they were paid 10 and 12 shillings a week, and in Ireland, where the average wages paid was only eight shillings without any other allowance; and yet, after a very considerable amount of experience in each district, I should prefer Northumbrian labourers at 20 shillings a week, to any of the others at half the amount. Where a Northumbrian, or Durham farmer, employs 10 labourers, an Essex or Gloucester farmer would employ 20. The expenses of estate management in Northumberland are no greater, than they are in the South of England, and in Ireland, where the labourer receives only half as much per day. The rates for contract labour are nearly the same in all the localities I have named. The farmer in Essex pays as much per acre for moving hay, as does the Northumbrian farmer. Draining in Ireland, in districts where the price of a day's labour is one shilling and four pence, is as costly as in districts in Northumberland, where the price of a day's labour is three shillings and four pence. The fact is, in purely agricultural districts, specially dairying and grazing, the population is frequently far too large for local wants, and to find employment, and keep down the poor rates, the farmer frequently finds it necessary to employ more men than he really wants, paying them in proportion to the value of the work performed; thus, instead of putting one man to mow an acre of grass in one day and paying him five shillings, he employs two men to do the same work, in the same time, and pays them five shillings *between* them.

The fact is, that these men, now agitating amongst the agricultural labourers in Northumberland and Durham, are in no way connected with agriculture; they are the stump orators who have lost their employment in the successful termination of the nine hours' strike amongst the mechanical Engineers of the district. They show their ignorance of the requirement of agriculture in the resolutions I have already quoted. While such regulations might work well enough in the factory, they would produce disastrous results, if applied to agriculture. The demand is for 20 shillings per week, and the factory hours from 7 A. M. until 5 P. M. with one hour for dinner. If farmers are to be screwed down to such regulations, it is a moral certainty that the position of the labourers will become much worse than at present. If the labourers get factory hours, they will be treated like factory hands. Farmers will get rid of all the aged and sickly men they now keep in their employment out of regard for their long service. On cold dusty days, instead of making work for their labourers in the Barn, or in the shed, they will turn them out to work on the roads, or send them home, and stop their pay.

Undoubtedly in some districts something should be done to improve the condition of agricultural labourers.

Bad farming, and low priced labour, go hand-in-hand. In districts where labour is scarce and high priced, the agricultural practice is good, machinery is more generally employed, and labour is more thoroughly utilised. It is therefore to be hoped that this agitation may at any rate have this effect, viz., the more equal distribution of labour over the country, thus causing the farmers in these more backward districts to employ a less number of labourers; to pay those they employ on higher wages, and to make a more general use of labour-saving machines.

Apologising for the length of this letter,

I have the honor to be, Sir,
Your most obedient servant,
W. R. ROBERTSON,
Member of the Royal College of Agriculture.

AGRICULTURAL STATISTICS.

GREAT BRITAIN.

The Statistical Department of the Board of Trade has published the returns of the extent of land under cultivation in Great Britain during the last three years, and the particular produce to which it is applied. The returns also include the number of *live stock* in the country during the same period. The following table shows the acreage of crops :—

	Wheat. acres.	*Barley.* acres.	*Oats.* acres.	*Potatoes.* acres.	*Hops.* acres.
1869	3,688,357	2,351,180	2,762,720	553,211	61,792
1870	3,800,543	2,371,790	2,756,308	587,616	60,504
1871	3,575,906	2,387,710	2,719,898	629,287	60,026

From the above we learn that in 1871 there were 75,458 more acres under the cultivation of *wheat* than in 1870, and 112,931 less than in 1869. *Of barley* it will be noticed that the table shows an excess of 10,960 more acres in 1871 than in the previous year, and 136,230 more than in 1869. *Oats* exhibit a decrease in 1871 of 43,902 acres as compared with 1870, and of 63,412 acres in contrast with 1869. *Potatoes* on the other hand, display an increase of 49,620 acres, and of 43,076 acres as compared with 1870 and 1869 respectively. *Hops* show a decrease of 503 acres in 1871 under the year 1870, and of 1,764 acres under 1869.

The following table accounts in a great measure for the *high rates* which butcher's meat has commanded during last year :—

TOTAL NUMBER OF LIVE STOCK IN GREAT BRITAIN ON 25TH JUNE.

	Sheep.	*Cattle.*	*Pigs.*
1869	5,313,473	29,538,141	1,467,452
1870	5,403,317	28,397,589	2,171,158
1871	5,330,322	27,132,808	2,499,890

Thus the number of *cattle*, which in 1870 exceeded 1869 by 89,844, showed a *falling-off* in 1871 as compared with 1870 of 93,985. *Sheep* appear to be rapidly *decreasing* in numbers. The stock of 1871 is no less than 1,264,091 head less than 1870, and 2,105,243 less than 1869. This is a decrease in two years of above 8 per cent., whilst our population is rapidly increasing. *Pork* promises to be very abundant. We have an increase of 328,751 pigs in 1871, as compared with 1870, and of 500,437 as compared with 1869. This represents above 20 per cent. increase in two years, and possibly we might expect a reduction in the price of hams and bacon, unless the scarcity of beef and mutton should increase the consumption of these articles, and thus uphold their present relative value.

IRELAND.

In the summary of the Agricultural Statistics of Ireland for the year 1871, issued by the Registrar-General, there is one important branch of industry which is shown in a very *unfavourable light*—viz., *flax-growing.*

In a series of articles published in *The Farmer*, we minutely entered into the question of flax cultivation, and endeavoured to show the profits that might be derived from its more extensive cultivation, not only in Ireland, but in Great Britain. It has been clearly demonstrated, we believe, that flax, could be grown with profit in many localities. Flax culture, however, appears to be losing its hold in Ireland. This year each of the provinces exhibits a decline in the acreage under the cultivation of flax as compared with last :—Flax was grown to the extent of 104,010 acres during the year 1870, while during 1871 there were only 156,764 acres, showing a total decrease during the latter year of 28,146 acres. Of the entire number (1,518) of scutching mills in 1870, 1,409 were in Ulster, 39 in Leinster, 30 in Munster, and 41 in Connaught.

The return also proceeds to enumerate the number and value of *horse, cattle, sheep, and pigs* in Ireland during 1870 and follow-

ing year. Of horses there was an increase of 4,967 in favour of the latter, compared with the former, the respective numbers being—1870, 532,657, as against 537,624 for 1871. In value there is little appreciable difference per head, the sums being 1870, 4,261,256*l.*, and in 1871, 4,296,529*l.* There is also an increase to be noticed during 1871, under the head cattle, the number being 170,052, the value 105,338*l.* In 1870, the number of cattle in Ireland was 3,799,912, estimated at a value of 24,099,428*l.*, while during 1871, the total number amounted to 3,969,964, the value being 25,204,766*l.* In numbers, and in the value of the sheep in the country during 1871, however, the decline is considerable. During 1870, there were 4,336,884 sheep registered in Ireland, while last year the returns only showed 4,238,066, a decrease of 98,818; the values were, 1870, 4,770,572; 1871, 461,873*l.*—showing a decrease of 108,699*l.* Pigs were also on the increase during last year, the numbers being, 1870, 1,461,215; 1871, 1,614,190—an increase of 150,975; the value in 1879 amounted to 1,826,519*l.*, while in 1871 it amounted to 2,017,737*l.*—an increase during the last year of 191,218*l.* The number and value of the stock in Ireland during 1871, therefore, compares very favourably with the preceding year, when the total was 35,557,775; as against 36,782,968 in 1871. The total increase of value amounts to 1,225,193*l.*

Compared with 1870, *wheat* shows a decrease of 13,892 acres, *oats* of 16,070, *barley* of 20,570, and *bere and rye* of 261 acres. There is an increase of no less than 14,704 acres in the area placed under *potatoes*, while the cultivation of turnips has fallen off to the extent of 11,897 acres in 1870. In the extent of land under *meadow* and clover, there is an increase in 1870 of 53,882 acres, and in green crops of 12,808 acres.—*Economist.*

TOBACCO CULTIVATION ON THE EXPERIMENTAL FARM—MADRAS.

From W. R. Robertson, Esq., Superintendent of Government Farms, on Special Duty; to the Secretary to the Board of Revenue,—dated Ootacamund, 20th February 1872.

With reference to the Proceedings of the Board, dated the 19th of December 1871, requesting me to state whether the Madras Farms can afford facilities for conducting the experimental cultivation of tobacco, as suggested by Mr. Broughton, I have the honour to observe that the tobaccos grown on the best soils of these farms, were recently analyzed by Mr. Broughton, and the results, I regret to say, prove most conclusively that tobacco of good quality cannot be produced on either farm. The following demi-official letter addressed to me by Mr. Broughton, refers to these tobaccos:—

My dear Mr. Robertson,—I have tested the samples of tobacco "Manilla cured by drying process" and "Dindigul country cured." The ash of former contains but 0·6, and the latter 0·67 per cent. of potassic carbonate. This is quite fatal to the quality of the tobacco, and I am quite of opinion that the soil of the neighbourhood of Madras can scarcely be made to produce tobacco of good quality. The former specimen is well-grown, and seems carefully cured. The nicotine has not been estimated, as the data above given are conclusive. I should be glad to learn the mode of cultivation and subsequent treatment of the tobacco, when convenient. The tobacco resembles a good deal that which I received from the Agri-Horticultural Society of Madras, but is much better cured. The same care in another district, would most probably produce a tobacco of good quality. The above results are quite supported by the smoking of the tobacco.

Faithfully yours,

(Signed) JOHN BROUGHTON.

Ootacamund, 15th February 1872.

I have no doubt that the tobacco sent would be gladly smoked by natives, who generally care more for strength than flavour.

It will be seen that the ashes of neither of the samples examined, contained 1 per cent. of carbonate of potash, a result quite fatal to the quality of the tobacco. The ashes of the best American tobaccos, contain as much as 2·5 per cent. of carbonate of potash, and some as much as 3·5 per cent. But these tobaccos are produced on land containing from 6 to 8 per cent. of carbonated potash, while the best soils of either farm do not contain ½ per cent. of this mineral; and it is practically impossible to render them as rich in potash by manuring, as the cost of the carbonated potash needed would *far* exceed the value of the land. But it is not only in potash salts that these soils are so deficient, for they are very poor in lime, phosphoric acid, soda, and all the more important ingredients of a fertile soil. An exhausting system of cultivation, continued for years, has on these soils, as on most of the light soils of Southern India, produced almost perfect exhaustion, at any rate, in the more valuable elements of plant-food, rendering many of the soils unable—excepting when heavily manured and thoroughly tilled—to produce anything better than the low type of crops generally cultivated.

Under these circumstances, I cannot recommend the Board to go to further expense in attempting to cultivate high-class tobacco on the Madras Farms. The crops grown were manured, as far as could be desired; they were manured very highly with manures rich in potash salts and other fertilizing substances; but analysis proves most conclusively that the tobacco is of no use for the European market, and it is produced at the great expense for the native market. We can however, in the ordinary way, with plenty of organic manure, produce at a profit, an abundance of such tobacco as is generally sold in the bazaars.

The new farms will, I hope, afford facilities for the experimental cultivation of tobacco; and I would therefore suggest that further experiments should be postponed until they are established.

In my recent tours over these Hills, the Nilgiris, I have seen many tracts of land on which tobacco might be expected to thrive; the soils are rich in potash, and the climate seems much more favourable for curing operation, than that of the low country.

SUGAR MANUFACTURE.

There are some very interesting statistics with regard to sugar manufacture in the last number of the *Indian Economist.* In France and England the best sugar is made from the white beet. Sugar is in Germany manufactured from mellons, which produce a very superior species of manufacture. The *Economist* tells us of the manufacture of grape sugar or sugar of fruits. Sugar has become a most important article of commerce. British sugar manufacturers have lately sustained great loss by the enhanced duties charged in France on all refined and other sugars used in that country. There has been an average addition of 8s. per cwt. to the scale of duty. The *Produce Market Review* thus estimates what a French Refiner, who melts 1,000 tons of sugar weekly and who enjoys seventeen weeks credit for the duty, gains by the interest on the duty between the time when he receives full payment for his refined sugar, and that at which he settles his accounts with the Government. As he sells for cash, at any rate in England, and can manufacture within a fortnight or three weeks, there must be three months interest on the weekly melting of a thousand tons. At the average rate of £25 per ton, the value of the duty on the weekly working would be £25,000, and taking the interest of this at 5 per cent for the three months, it appears that the weekly gain would be £300, or about £15,000 a year. As the duties have been raised 8 shillings on the cwt. on the average, £4,800 of this gain is interest, at the expense of the public, and will be additional to what the refiners received under the former system. At the new rates of duty the Government will give the refiner making 1,000 tons credit on £8,000 a week more than it did before. This goes on for seventeen weeks, and the refiner is thus saved from the necessity of investing £136,000 more capital in his business than he did before. At the end of seventeen weeks' work the refiner will owe to Government £425,000, of which three-fourths would be clear gain of working capital, supposing the operation of refining to be completed in a month and cash to be obtained on sale. The result of this is that the Government supplies the refiner with £300,000 capital with which he may buy his sugar; and as the cost of sugar in bond is less than the new duty on it, he can carry on his works without investing a penny of his own money, and entirely at the expense of the State. Truly the French Refiner is a favoured mortal! It is a matter for great surprise that the importers of East and West Indian sugars into England do not see how seriously the proposed French Sugar Law will injure their trade. Since the Convention was signed, and in consequence of the preponderance it has given to the French Refiners, the production of beet sugar has increased with the greatest rapidity. Nearly one-third of our consumption is now fed from the beet, and if the new French scale become law, it must gradually drive cane-sugar out of our market, or at any rate ruinously lower its price. If the French Refiners have a benefit over ours of 8s. per cwt., it is clear that our leaf sugar refiners, who use probably 100,000 tons per annum, can only compete with them by giving 8s. less for their raw material. If this took place, either the English colonists would pay the French sugar-tax on foreign ships, and send 100,000 tons of their sugar to France, or they would have to cease producing that quantity. If again, as is very probable, a large export trade in pieces from France to England takes place, our colonies will be still more seriously injured. It is a question indeed whether the French law before the Chamber would not only destroy British sugar refining, but the British raw sugar trade root and branch. The *Review* advises the English Refiners to go to Versailles and state their grievances to the French Assembly. We do not think that much would be gained by such a move. The French have too much to think of in their paying off their war indemnity to consider other interests which interfere with their realising the means of defraying it. This is only one of the many evil results which have come to England from the Franco-Prussian War.—*Deccan Herald.*

MISCELLANEA.

Interesting Experiment with Plants.—It has long been a question among botanists and physiologists in how far colour can influence the growth of plants. On this subject M. P. Bert has addressed an interesting communication to the Academy of Sciences. Having placed twenty-five kinds of plants in a greenhouse provided with glazed frames of various hues, he watched their progress under the influence of the different lights they received. Millet and mullen figured among the plants requiring much sun; violets, &c., among those wanting shade; cactuses and house-leeks represented the thick-leaved classes; there were besides green cryptogams, plants strongly tinged with red, such as Perilla, and lastly, firs. The individuals of each species were of the same size, having been sown at the same time. The glass of the frames was respectively transparent white, dull white black, red, yellow, green and blue and the whole greenhouse was shielded from the direct rays of the sun. The observations commenced on the 20th of June; on the 24th various seeds were sown, which all sprang up at the same time in all situations. On the 15th of July the plants requiring the sun were all dead under the black and the green frames, and were very sickly under the other colours, especially the red. The other plants were all declining. The mortality continued to increase, and on August 2nd all was dead under the blackened glass, except the cactus, the lemna, fir, and maiden's hair; under the green grass nothing was left alive but the geraniums, celery and house-leek, besides those that were not dead under the black; but all were in a bad state. The mortality was much less under the red glass, and still less under the yellow and blue ones. On the 20th of August the acotyledons alone were still alive, though perishing, under the black and green; and as to the rest, the red had proved more hurtful to them than the yellow and blue. The stalks were much taller, but also much weaker under the red, blue seemed to be the colour least detrimental to the plants: their greenness had remained natural, and even deeper than under the yellow. The plants sown on the 24th of June had all died off very quickly under the black and green, later under the red, and had thriven better under the blue than under the yellow. As for the plants under the white glass they all continued to live, though less luxuriantly under the dulled than under the transparent glass.—*Galignani.*

The Foresters' Gazette.

BOMBAY, 21st MAY 1872.

DISTRICT ARBORICULTURE.

From Baden Powell, Esq., Conservator of Forests, Punjab; to the Officiating Secretary to Government, Punjab.

II.—Planting by District Officers and Local Committees.

The orders given by the Board in 1852 were that:—

(*i.*)—Trees should be planted round every description of Government building.

(*ii.*)—That nurseries should be formed at every three miles along the canals, (to be done by Canal Officers) and also at Jails, for the purpose of distribution.

Also—

(*iii.*)—By the circulation of a note, (Department Public Works, Circular 13, of 1867), describing the results of trench sowing of keekur on the Lahore and Peshawar Road, and calling attention to this means of road planting.

(*iv.*)—There is a circular (Financial Commissioner's No. 6 of 1868) on the general subject of Government tree-planting.

To carry out these purposes, each district has had a money-grant in the Local Fund Budget. In 1865, it was directed that this grant should be expended under the advice of the Forest Department, and after some consultation a tabular form was adopted, which was to be submitted in duplicate to the Conservator of Forests, who was to countersign it in token of approval, as directed in Department Public Works Circular No. 13-2852, of 25th April 1866.

Only 12 districts have, however, regularly submitted these papers until (quite recently). The form was as follows:—

Districts.	Trees in Government Gardens	Trees in Public Gardens	Trees in Jails	Trees in Public Buildings	Trees in Public Roads	Trees in Canal Branches	Trees in Canal Distributaries	Trees in Canal Minors	Trees in Canal Nurseries	Trees in Public Nurseries	Remarks.
1	2	3	4	5	6	7	8	9	10	11	

7 MAY

The result has not been very satisfactory, chiefly owing to one great want which will be noted presently. No. 1 column is rarely filled in accurately, and not being so, the Conservator is at once deprived of the principal value of supervision, *viz.*, by seeing how far the sum spent in the previous year had good results. Moreover, to make the column valuable, there should be a perpetual balance carried forward so as to be sure not only that the work, say of 1869-70, was known, but that of 1868-69 and previous years, was kept in view also. To show how little results from this form, I will take two districts (of which I happen to have received papers very regularly), Gujrát and Sháhpúr. In the Gujrát District, for 1868-69, 30,000 trees were entered in column 1, as the successfully surviving work of 1867-68, and the work of the year was to plant out 25,000 trees. But the statement of 1869-70 still showed 30,000 in column 1. The work of that year was again to put out 37,500 new trees, but in spite of this large number the 1st column of 1870-71 again shewed only 33,000. the results of the district expenditure are hence quite unknown.

In Sháhpúr the return of 1866-67 shewed 84,250 trees alive, and 60,000 new ones; the return of the next year is missing, but in 1868, the survivors were 44,000, and 22,500 new trees to be planted. In 1869-70, the survivors were 1,25,164, the new work 18,000. In 1870-71, the survivors had dwindled to 40,700, but the new work was 41,000, when in 1871-72, the survivors again rose to 1,80,502. (the great difference being in the Bhera Tehseel). To calculate percentage of failures is therefore not easy. Siálkot shows a pretty constant *failure* of 75 per cent.,* which I can hardly credit: other districts show a failure of 25 per cent. and less.

(*Establishment*).—In column No. 3 there is an immense variety, some districts using only coolies, others "mallis" as well; some have "bhisties," others not. Some exhibit large expenditure on bullocks. In the Jhung District, the returns shew to be *purchased*.

In 1868-69,	10 pairs @ Rs. 40 each	Rs.	400
1869-70,	" " @ " 50 "	"	200
1870-71,	" " @ " 62 8 "	"	250
1871-72,	not stated but six pairs mentioned as fed..	"	300

I have called attention to this, and the matter has been explained, but even the necessity of such correspondence would cease if the work were done on a *system*. In Sirsa District, in which I suppose tree-rearing is attended with much the same difficulties, large numbers of bhisties with 'pakals' (large leather water-bags) are employed. Columns No. 5 and 7 are the subject of much remark, because seedlings *ought* to cost nothing beyond the cost of making or maintaining nurseries, and the carriage, if these are suitably located, would be very small, but many returns show considerable sums spent under these heads. On the whole, it is clear to me that very little information is derived from these returns, and that they prove insufficient to enable this Department to understand what is going on. My practice has generally been to sign the returns, subject to letters of remarks, in which I have set forth such matters as appeared right to suggest to the Commissioner, but it is always an invidious task to criticise where the grounds of information are slender, and where the heavy duties of a District Officer leave him little time to correspond about such matters. I have carefully perused the enclosures of your letter under reply, but the information as to the results of district planting is imperfect. The enclosures in question consist of brief reports from the 10 divisions, which, for convenience of future reference, I abstract in a tabular form. The information is various, only a few districts giving details. The results are usually shewn in acres, but it is not said how many trees on an acre constitute that acre planted, nor, as a large part of the area must consist of *avenues* or *lines* of trees, how the planted acre on a road is calculated. In some districts plantations made by the Forest Department are included, and possibly those made by Canal Officers, as for those by Public Works Department on Imperial road-sides, it is not always understood whether they are included or not.

Division	District.	Area planted	Particulars and Remarks by Conservator
		Acres. R. P.	
Amritsar	Amritsar	697 3 7	Area of road side and other Government plantations, but cannot surely include the Nag (Forest Department) plantation, which would monopolize two-thirds of the area and all the station roads, Grand Trunk Road, and Canal back plantations.
	Gurdáspúr	1,052 0 0	"Area of road-side and other Government plantations."
	Siálkot	None.	Proprietors of wells keep up nurseries, and roads are supplied with plants. Their area ought to be given. Returns show:— 1869-70, trees 2,27,000 planted out. 1870-71, " 2,40,500 " 1871-72, " 2,03,500 " In this year's it is said that 60,041 survived from 1870 planting. If this has been going on long, the area must be considerable.

* NOTE.—The planting being about two lakhs of trees, and for the returns of three years (which I have seen), column 1 showing from 30 to 60,000 survivors each year.

	District	Area planted			Particulars and Remarks by Commissioner.
		Acres	R.	P.	
Lahore	Lahore	141	3	7	No particulars of any kind, but certainly does not contain the Forest Department plantations at Tera, Jugran-cum-Shadra and Changa Manga; also is supposed to include *only groves*.
	Gujranwala	263	0	0	Said to include "Government plantations" on Grand Trunk Road and District Roads, but excluding avenues on ditto, ditto.
	Firozpur	382	2	8	No particulars.
Jullundur	Jullundur	175	3	0	4332 acres in *Jullundur* Tehseel only, this must *include* the little forest plantation of 46 acres, also, I should think, a *great deal of* road and other planting. Philor Tehseel has 1[illegible] acres, also excluding the Forest Department plantation. Nakodar Tehseel 265, and Nawashahr 293-10.
	Hoshiarpur	2[illegible]	[illegible]	27	Exclusive of the 510 acres Forest Department plantation on Nauchaua island in the Beas, and consisting of 41 groves on various road sides, mostly 15 to 20 poles in *extent*; appears to exclude avenues and station planting
	Kangra	[illegible]	2	5	Consisting of 14 *groves*, which seem to be excluded from other returns, one *for* plantation attached to Bhawarna Tehseel, and 4 plantations of "dead ir" at Dhurmsalah, aggregating 12 · 15 acres.
Ambala	Ambalah	1,0[illegible]0	[illegible]	15	The smaller area being Rupar to 1,10, and the large at Jagadhri, 1,37 0 2[illegible] ("road side and other Government plantations"), but the Jagadhri area, I believe, includes Forest Department, 200 acres, which is not yet worked
	Ludhiana	293	0	0	This excludes of course the village plantations, and include the Forest Department plantation (about 200 acres?)
Delhi	Delhi	1,[illegible]74	0	11	This includes the Forest Department plantations (not nearly stocked yet) at Feloori (200 acres), and Delhi (510 acres), and excludes (evidently) road side plantations, avenues, &c.
	Karnal	[illegible]	1	0	"Road avenues"; and there are no other Government plantations
	Gurgaon	91	3	0	This district gives the number of trees and a list of roads, of which there are 24 planted, besides station roads, in all having 30,[illegible]32 trees, at the rate of about 170 trees per acre.
Hissar	Hissar	1[illegible]2	0	0	Of which 130 acres are avenues, the rest groves, &c.
	Rohtak	1,137	[illegible]	37	Of which 90[illegible] are avenues, ditto ditto.
	Sirsa	2,6[illegible]	[illegible]	37	Of which 2,40[illegible] are avenues, ditto ditto
Rawalpindi	Rawalpindi	16[illegible]	0	[illegible]	"Road side and other Government plantations"
	Jhelum	740	[illegible]	0	Ditto ditto.
	Gujrat	90[illegible]	0	10	Ditto ditto.
	Shahpur	1[illegible]4	1	29	Ditto ditto.
Multan	Multan	[illegible]0[illegible]	0	0	"Road side and other Government plantations"
	Jhang	17[illegible]	0	0	Ditto. ditto
	Muzaffargarh	78[illegible]	0	0	Ditto ditto
	Montgomery	90[illegible]	0	0	Ditto, exclusive of Forest Department plantation
Dera Ismail Khan	Bannu	2[illegible]1	[illegible]	[illegible]	Road side.
	D. I. Khan	None given			Some road sides planted from nurseries at Derah Ismail Khan, and the Dilkosha Bagh at Bakkar on private land adjoining roads
	D. G. Khan	1[illegible]4	1	[illegible]	One Tehseel (Sanghar) has nothing, and Jampur 12 acres only
Peshawar	Kohat	[illegible] miles of road			[illegible], to Khushalgarh, to Kiwaga Khwar, and to Hangu, with 1,3[illegible] trees
	Hazara	57	2	[illegible]	[illegible] acres of garden or grove and 10 miles of road
	Peshawar	173	1	1	"Road side and other Government plantations"
	Total acres	17,119	[illegible]	11	

This gives a total of acres 17,119-3-11, but evidently does not represent the real results of tree-planting since annexation. I think it will be desirable, and especially in connection with the proposals that are presently submitted, to obtain more complete returns from each of the different authorities which plant, as follows:—

(a.)—District Officers to report list of *roads*, including station roads, that are planted, specifying whether on one side or both, in single or double lines on either side, and the distance apart of trees: the prevailing kinds of trees should be noted.

(b.)—List of groves made by the people under orders of Financial Commissioner's Book Circular 72 of 1868, also under other arrangement, or agreement, or legal compulsion.

(c.)—List of groves and gardens *having trees or nurseries*, and of nurseries made by District Officers, and public buildings planted about with trees.

(d.)—Public Works Officers in charge of roads to report length of road (by districts) planted, and groves and nurseries.

(e.)—Canal Officers to report (by districts) the same of their work.

(f.)—I can furnish the list of plantations made by this department. Every officer should specify the method of irrigation for each grove or other work, *viz.*, percolation, as on "bela" lands or canal banks, natural rain-fall, well or canal irrigation, &c.: and lastly, each reporting officer ought to furnish a complete, but brief statement of the total expenditure incurred as far as it can be ascertained, giving the total in any case, and, if it is possible, separating establishment costs from the rest.

Hitherto we have spoken of tree-planting generally, without any allusion to the widely different circumstances of different districts as regards soil and moistures which difference, affect materially (1) the cost of planting, (2) the nature of planting operations, and (3) the method of treatment.

It will therefore be proper to consider the different climates we have to deal with, and suggest the sort of operations that each district should maintain.

All districts having *sailaba* lands, "belas," &c., will have no difficulty in rearing sheesham groves and planting any roads that traverse such tracts. There is natural percolation; and the success of sheesham groves in the Gujrat sailaba, the magnificent avenue of sheeshams from Muzaffargarh to the river, the sheesham groves on sailaba in the Montgomery district, prove the adaptability of this class of land. We may dismiss this subject from further mention with the remark that in all "district planting schemes" (presently noted), the utilization of all such 'sailaba' opportunities ought to find a place, independently of the general proposals, which will shape themselves according to the following considerations. Leaving, then, *sailaba* and *bela* lands, we have the following conditions:—

(1.) Districts with canal water. Where this is the case gardens, avenues, groves, and all kinds of planting can be done.

(2.) Districts with rain-fall of 25 inches and upwards. In Hoshiarpur, Kangra, Gurdaspore, parts of Ambalah and Ludhiana and Karnal, trees will grow by the aid of rain only, hence avenues are equally possible with other forms of plantation

(3.) Districts with 20 inches or thereabout. Avenues here become difficult, except where *kikar* will grow from seed. In good soil avenues may be attempted with the aid of trenches of collecting water.

(4.) Dry districts like Jhang, Sirsa, Montgomery, Multan, Hissar, Rohtak. In these avenues ought not to be attempted as a rule: as many groves as possible, aided by wells, and tamarisk to be grown in drainage cuts, are all that can succeed.

I shall now offer some suggestions how planting should be worked in the four classes, premising that *I speak of general district culture, and not of the exceptional treatment of station roads, &c.* In the latter it is generally possible to give a great deal more supervision, and also to go to greater expense. Thus, in stations, watering by "bhistees" may be allowed, but as a general rule, money spent on this for district work, is absolutely wasted, and should only be allowed as a contingent and temporary measure, under circumstances presently noted. I shall offer some separate remarks on station planting. Before proceeding to take each class *seriatim*, as I shall frequently have to speak of *nurseries* and transplants from them, I had better dispose of these indispensable adjuncts to district arboriculture first. District Officers must judge of the localities for nurseries. Unless they have exceptionally good and retentive soil, with abundant rain-fall and subsoil percolation, (in which case nurseries can be formed without the aid of wells or canals), they will have to be of ½ an acre to 2 acres in extent, where there are wells or canal cuts; but hard and deeply cracking soil must, if possible, be avoided, and a *salt* well is worse than none at all for most trees. An area of one acre will generally supply from 40 to 70 acres of plantation. Irrigation requirements being met, the nurseries should be put in convenient localities as centres of supply, so as to enable trees to be taken out and put into their places with as little carriage and exposure to sun and air in baskets or carts as possible. They should be near Chowkies, Serais, Tehsils, Jails, Bardasht Khanas, &c., so that they may have a chance of being looked after.

Nurseries should be ploughed or worked all over 15 inches deep. The better prepared and the looser the soil, the stronger will be the plants. Pits may be dug for the collection of *dead leaves*, which should be stored, but must not be used *till thoroughly* decomposed. No animal manure should be used, but many nursery beds will be benefited by a liberal digging in with this leaf mould, and a proportionate quantity of river sand, if the soil is very stiff. At every nursery, if you have a good many rare plants, such as *Eucalyptus, Ailanthus*, "toon," and nice trees generally may be raised in pots for transplants in favourable localities, and where it is especially desired to have nice trees, as at Tehsil gardens, &c. If the nursery is not to be artificially watered, it must be sown broadcast just at the beginning of the summer rains, and the trees will be fit for transplanting during the next summer's rainy season. If the nursery is to be watered, it may be done either by a series of little 'nullahs' 8ft. broad and 4ft. deep, sowing the seed on the earth from them formed into a ridge at the side, or else the ground

may be divided into little beds or "kyaris" in the native method, and seed sown broadcast. This applies whether well or canal water is used. It is impossible to say how often to water,—it depends on soil and climate. The soil must be kept moist only till the seed comes up. Look at the soil a few hours after watering,—it ought then to be moist, but not sticky or in mud. Once above ground, the seedlings indicate the state of the water-supply. There is greater danger of too much water with canal overflow. The plants ought not to look 'forced' with excessive moisture. Artificially watered nurseries are sown in the beginning of March, and the plants will be ready for either summer or winter rains' transplanting in the *same* year. Trees of the following shapes are the best.

When transplants are taken from unirrigated nurseries or from irrigated, and planted out in the same year's rainy season, they ought not to be cut down; but when taken from *irrigated* nurseries and put out in next February on to canal-irrigated land, they should, if tall and tapering, be cut down, with a clean sharp cut, to within two inches of the ground. Now to return to the classes of districts above-noted,—

(1.)—As regards canal irrigation, whether for a grove or a line of trees, overflow is the great *desideratum*; for where the canal water has to be raised by "pakies" there is cost of bullocks and "beldárs," and in a limited degree the cost attendant on well irrigation. But, whichever there is, the best system is to make a trench along which the water runs. The soil out of the trench is turned up on one side forming a ridge, and on this ridge seed is sown in a line. This will succeed on all but bad or hard soil, in which, if necessary, careful transplanting of small trees from nurseries must be made on the ridge thrown up as before, or, if the soil is very bad, tamarisk cuttings may be put in. Groves are made in the same way. Where trees are *transplanted* to form groves and avenues watered by canal, the cheapest time to transplant is in December, January, and February, because there is then no need to be careful about maintaining a ball of earth round the roots; in transplanting in July, this should be kept on. Sowing on ridge by canal irrigation is best done in March, but it is possible to sow up to 15th August.

(2.)—*Districts with scanty rainfall.* Here both avenues and groves are best made by transplants from nurseries. Transplant in the beginning of the summer rains and, where winter rains are abundant, during them also. In heavy places, especially where the soil is hard, it will be necessary to make deep cuts to collect the rain and retain moisture; the plants are put in on the ridge of such cuts. Drainage water may be led into the cuts where necessary. If the rains fail, or a period of drought ensues, it may be necessary to sustain transplants by bhisties. Where 'keekar' will succeed, it is not transplanted, but a trench made and seed sown in line on the ridge. (N. B.—Jhelum, Gujerat, Sialkot, &c.)

(3.)—*Districts with comparatively rainfall.* Here we shall always have to look to artificially-irrigated nurseries; and if it is desired to try and make avenues or work without wells, &c., transplants must be put out in the beginning of the rains, and bhisties will have to be called on, perhaps frequently, to save the life of trees, if the rain stops or fails. This points to the necessity of making few avenues and many small groves, which should not be more than four acres, and should be supplied by a well to be quite safe; this is far the best plan in such districts. I would make no rule that the groves should be a certain distance apart—it is not wanted. If really successful avenues are wanted, walls must be made at certain distances, and the water carried along courses to transplants put in at 10 or 12 feet apart. If the water is not far below the surface, it will be cheaper to make more wells, and there will be less labour to keep up a flow for the short distance; if the depth of well is great, and construction costly, then it is better to expend labour.

(4.)—*Dry Districts.*—These present the greatest difficulty, and we must be satisfied to have even the worst kinds of trees. Avenues are out of the question, unless the road passes through well-irrigated fields. Small groves, (worked each by one well) of not more than four acres, should be encouraged. The more groves the better. All rules about distance should in such places be suspended.

Mr. Amery calculates that, in districts where the water is 60 feet below the surface, an acre of the trees at the age of 20 years will have cost Rs. 1,500, or about Rs. 7 per tree (at 200 trees to the acre), but the value of trees in such climates is enormous. In such districts *no labour is too great*, to put trees in holes, with the soil loosened and worked to *the greatest possible depth*. All watering by bhisties is simple waste of money, for their utmost efforts can never succeed in moistening the soil beyond a very inconsiderable depth, so that even if a tree should grow in good soil, its roots will always remain near the surface; and ordinary windstorms will knock it over, and any cessation of the water-supply endanger its life. Exactly the same will result from an attempt to operate on too large an area with one well; four or perhaps five acres (at the outside) is the size, the well working night and day. This would cost Rs. 300 a year for labour in watering. The trees should be raised in nurseries, one acre to every ten of plantation; such nurseries should be sown in March, April, and May, and thinned out to a foot apart in July. The trees would be ready to be planted out in the following February and March, and must be watered continuously till November, when they may be left for three or four months. Of course watering may be suspended during unusually favourable rain. All cuttings and road-side drains should be planted with tamarisk cuttings or sown with tamarisk seed, which, I believe, germinates best if first soaked in water. Cuttings can only be put in during rain. The water lodges for some time in all deep cuts and moistens the soil for a long time. The growth of tamarisk in the Railway cutting near Montgomery illustrates this.

Every effort should be made to give the groves or plantations all the benefit that the natural rain-fall can supply. Mr. Amery makes the suggestions that, whenever in such districts earth-work is done for roads, &c., it should not be taken from the side over a large flat area, but cut out of trenches of moderate depth, which would then be left ready dug for tamarisk growth. Plantations within reach of the Railway cutting at Montgomery might be rendered very moist by carrying a trench from the cutting, so as to let the rain-water flood the plantation. A letter about planting at Montgomery has been addressed to that district. Lastly, in all such district groves, put the trees close, not more than three feet apart. The great thing is to *cover* the ground; it is easy to thin out afterwards when requisite. As to the kinds of trees, most District Officers know by experience what to grow. In this Department Mr. Ribbentrop prepared a series of notes on the growth and treatment of the commonest trees, but this was taken by Mr. Brandis, from whom I have just heard, promising its speedy return; it may be then printed and circulated. Always grow the best trees. Keekar should be grown for its value and its being raised from seed without irrigation. Grow 'toon' where possible, and 'shisham' (avoiding for it hard, bad soil) and 'nim'; also for avenues 'jamun'; avoid mulberry trees if a handsome avenue is wanted, but for ordinary district purposes they are not to be despised. Bukain and siris are fair trees for shade, especially the tall variety of siris (*acacia elata*) the 'safed-siris' or 'baro' of the Dhun. About Delhi, the tamarind and the 'mimusops'* can never be grown too largely. The tamarind does well also at Ambalah.

A few words may be added about station planting. Every station might, I think, have a public garden, small or large, according to the size of the place, in which there should be a nursery not only for growing ordinary trees, but for getting up the rarer and better sorts in pots. Avenues in stations are requisite, and they should be made by transplants, remembering that the harder the soil, and the worse its quality, the cheaper it will be in the end to make the holes very deep, and work and loosen the soil thoroughly. A higher rate for such transplants should not be grudged. Good trees should be selected, and if a tree fails or gets nibbled by cattle, it should be taken out at once and a better one put in. Fencing must be done; mud wall circles, if made, should have apertures below to facilitate drainage and circulation of air, but a continuous fence along a line of trees is best. *Aloes*, American *agave*, *guava*, &c., should be planted inside the fence, and further protect the trees after the fence comes down. The most efficient fence I have seen for *single* trees is the sort of bamboo crate made at Delhi by the Deputy Commissioner, rather costly at first, but lasting. In large stations cattle *must* be kept in order. The number of trees destroyed by cattle during the years I have been at Lahore is enormous; and trees, once well-nibbled down, *never* recover. If mulberry trees are planted, they should be set in intervals with better trees, so that they may be cut out when they begin to look shabby. At the corners of roads, and at places where roads cross, nothing is more effective than to get up shrubberies,—a few trees in a clump for the centre, and round them plain flowering shrubs, *duranta*, *oleander*, the pretty yellow-flowered *tecoma ecoasta*, all obtainable easily from the Agri Horticultural Society. Rose bushes of the common pink kind should be used wherever they will grow, and wherever there is canal water; they strike easily from cuttings, and are exceedingly ornamental. While on the subject of station planting, I have frequently been addressed about planting of various cantonments and military stations, both in the hills and plains. I may therefore throw out a suggestion for such future consideration as it may seem to merit, *viz.*, that European soldiers should be employed in the work,—transplanting carefully from nurseries, provided the success of soldiers' gardens in many places shews that there must be a considerable number of men here and there who know something of gardening, and this knowledge might be turned to account in this way. Especially I would suggest this with regard to Kasauli, Dagshai, Subathu, and Balun. A word may be added about *lopping*. In the district, as a rule, this should not be done at all; that is really the safest plan; but in a station the passage of carriages and the partial breakages occasioned by storms render it necessary. It is impossible in a letter to give any adequate information on a subject which has filled in France more than one book. One excellent pamphlet may be named, *viz.*, M. DeCourval's† &c.

* Species :—M. Kauki ; Mr. Hexandra, called "Khirni."

† "Taille et Conduite des Arbres Forestiers," par M. de Vie, De Courval,—Paris, 1861.

soon as Dr. Stewart's forthcoming work on the trees of Northern India appears, I hope the subject of an arboriculture manual will receive attention; in such a manual these subjects can be more fully treated of. Here, seeing the inferior agency that we have as a rule to employ, I can only suggest that as *little lopping as possible* should be done; only remove pendent branches, that *must* be removed, because they are in the way. Remember what M. DeCourval says,—"In all cases it will be better a thousand times not to touch a tree at all, than to give it up into inexperienced or clumsy hands." Let anyone examine the station trees at Lahore; 40 per cent. are almost irretrievably spoiled by bad cutting. A tree is required to maintain a perfectly equal growth and distribution of the sap. A large branch inopportunely hacked off at one side close to the trunk, throws the balance of vital force all at once backward to the opposite side, and a hideous elbow joint is the result. The only suggestions I make are:—

(1.)—Less harm is done by shortening branches than by absolutely cutting them off at the trunk. Where a branch is shortened, always leave a few natural sprigs bearing leaves towards the extremity.

(2.)—Never cut too many main branches from the trunk in one year; two or three is ample.

(3.)—It is absolutely necessary to supervise the people cutting, and to furnish them with good tools, so that *whatever cut is made it is perfectly clean.* At present coolies are sent out with a blunt jagged "datri," and the branches exhibit a number of slices at the end, and are partly torn. Any branch that cannot be cut with the strong, heavy, and sharp knife, must be *sawn* with a sharp saw*. (The capabilities of Indian tools necessitates this observation.)

(4.)—Trunk branches should be cut as close as possible to the trunk and *vertically*, so that the cut may be parallel to the stem fibres. It is good to begin to cut *under* the branch and *upwards* for half its diameter, than cut down; this will surely prevent the great evil so commonly seen, *viz.*, cutting the branch from above, partly through, and then either purposely (or by the weight of the branch), furnishing with a *tear*, which often carries with it a strip of bark and some of the *alburnum* or sapwood too. The accidental injury caused in this way by heavy branches falling, should always be prevented by cutting off a large portion at about three feet from the trunk, and then making the final trunk cut.

It would be very desirable to make it a standing order that Municipal and Local Committees were properly furnished with a few large, heavy, and sharp steel pruning-knives, and some good saws, and that all cutting with the "datri" be absolutely and without exception prohibited. In concluding this part of the subject, I have now to offer a suggestion as to the future regulation of district planting operations. The present returns may be discontinued, and for each district a "district planting scheme" should be drawn up.

These should be first submitted for a careful review in this Office, with power to ask for additional information, and to suggest amendments. When all this is done, the scheme as approved and arranged, should be submitted to Government through the usual channels. I would certainly append to each of these schemes a set of papers, embodying distinctly the information (from each Department concerned) proposed; this of course would be done once for all. The scheme itself should consist of:—

(a.)—A sketch map of the district, showing merely the division into tehseels or purgunnahs, the site of all schools, and every sort of public building, and the lines of road, district and imperial, kutcha or pucka, which are, or ought to be planted with avenues or groves, or both, according to the nature of the district.

Existing avenues, &c., might be indicated by a thin red line on one or both sides of the road, broken or unbroken, according as the trees are on both sides and the lines complete or not. I do not mean that this can be done with any great accuracy, but, put in as on a sketch map, will show generally the state of things. Groves and gardens or plantations are indicated by red squares, marked G. for garden, N. for nursery, and G. N. for both; groves and plantations are indicated by the squares without any letter. Then all roads which are *to be* planted and *can* be, or where groves are *to be* made by Government agency as well as all *buildings* (which are, it is to be remembered, *ordered* to be planted out), but which are not yet so adorned, should be similarly marked in *green*, so that red will indicate what is *done* before the new system started; green, what is to be done. I would not mark in *more* of these proposed places of work *than can be fairly taken in hand during the next five years*, or even *three years*. The map will, of course, not show *station* plantings, because it will not and ought not to be big enough, or it would be unwieldy. It would be prepared by a simple tracing from existing maps. As the opportunities of planting on *usiloba* lands are special, and may exist in all districts, I would adopt a special method of indicating them, say by *dotted red*, instead of the uniform tint.

(b.)—The map will be accompanied by a narrative paper, detailing the operations proposed to be performed in each year, and giving the cost of operations (which is very easily ascertained), and suggesting the expenditure of such a sum as is usually allowed in the Local Fund Budget. The roads will be specified, the nurseries to be made, the buildings to be planted, and the establishment to be entertained,—this all divided distinctly under each year of the five or three to which the scheme relates.

(c.)—The proposals for station planting will be recorded separately.

(d.)—At the close of the year, a brief report must be drawn up, a copy of which should always be filed with the scheme, showing how far the year's works have been accomplished, and with what success, and proposals thereon made, if necessary, to put what has been left undone, or the re-doing of what has failed, into the work of the next year, leaving certain works of that year for future accomplishment.

Should any private persons have constructed groves, &c., under encouragement or compulsion during the year, a separate brief note of this should be put up. A distinct account of expenditure must form part of the report, and a distinct statement of the failure or success of each grove, avenue, &c., &c., &c. Thus, when we come to the close of the period to which the scheme relates, we shall be able to view (1) the expenditure, and (2) the actual successful work, to compare it with the proposals, and then to see what work has been left undone, so as to take care and provide for it in the *next* period. It may be said that this will give a great deal of trouble, but I can confidently assure anyone who regards the written detail as formidable, that in sitting down to make such a scheme, very much less difficulty will be found than at first sight appears, and secondly, I belive that under no other system can we secure a control over expenditure, a knowledge of our progress, and a certainty that we are getting something for our outlay. I would invite officers to correspond freely (D. O.) with this Office and the Deputy Conservator in the Plantation Division. Information and suggestions, as to preparation of such schemes, method of planting, &c., can in this form be most easily interchanged, and we shall be always ready to answer to the best of our ability, as well as to supply seed or plants when possible.

(3).—*Planting by Canal Officers.*

The only orders I have seen are those in the Board's Circular No. 15 of 1852.

(i.)—This has been already alluded to, *viz.*, that all new cuts from canals be only made on the zemindars agreeing to plant both sides of the water-courses with trees at intervals of 14 feet.

(ii.)—Along the canals, the officers in charge are to raise young plantations at every three miles for the purpose of distribution of trees.

Dr. Stewart reported on the work done in 1867. The canal plantations have been, by the orders of the Government of India, No. 21 F., dated 10th January 1870, since removed from the direct control of this Department, because it was not possible that long isolated lines of trees could be efficiently supervised by Forest Officers, but it was said that annual reports were to be furnished to the Conservator. For the past year no such reports have been received. It would be desirable to ascertain from the Irrigation Department how far lines capable of being planted have been so, how far nurseries exist, and, above all, as before suggested, what minor canal branches, or rajbuhas, are permitted to be planted, and on what principle, and what lines of this sort might still be done.

(4).—*Plantation by Public Works and Railway Officers.*

It would be a good thing to know how far each line of road under Public Works Officers is planted, and to have definite proposals for completing the work. The operations for planting our road systems ought to be laid down as clearly as the district. For planting on the Railway something has been done, but very little. There are many places along the Sind, Punjab, and Delhi line, which are eminently suited for planting. There are many stations which might have groups of trees around them. Hardly any part of the line about Ambalah and Ludhiana would not support an unirrigated growth of keekur sown on the embankments. I do not know how far it would be possible to get the Company to take up the subject, but to have any good result it must be on an organized plan,—the line being given into so many separate charges, each planting a given section.

(5).—*Planting by the Forest Department.*

It is now well recognized that the work of this Department, to be economical, must consist in making plantations concentrated on large areas for fuel or timber supply, and hence the tendency has been lately to get rid of all those small outlying plots, scattered

* M. DeCourval never uses a saw, but a heavy knife of steel, 1,500 grammes in weight.

* I write this intending its application to such localities only as can be planted without risk.

[illegible] which [illegible] [illegible] [illegible]

after which they came up capitally, and made good progress. A shower of rain, which fell on the 21st, kept up the vigour of the plants until the monsoons fairly set in, the seedlings having attained one foot in height, were thinned out on the 10th July. Great care was taken in selecting the strongest and most promising plants, no attention was required from this date (besides letting off surplus water) until the 26th, on which date the field was weeded and the surface well-loosed up with the kourpa. Nothing further was done to the plants until the 30th August, when all plants, close upon four feet high, had their leading shoot "topped," in order to encourage lateral growths. The field was again weeded on the 6th September, by which time the plants had mostly a good show of flower-buds and pods on them (some of the latter being well-advanced towards maturity), and looked nice and healthy, but towards the end of the month, the plants began to lose color, and a heavy shower of rain which fell on the 29th damaged the plants considerably, knocking off a great many of the buds and pods. A few early pods having opened were gathered (16 lbs.) on the 10th October; it was again picked over on the 21st, when 22 lbs. were obtained, and irrigated for the first time the 27th (which was the earliest date on which water was obtainable); repicked on 5th November, 40 lbs. being obtained again; irrigated on the 11th November, and repicked on the 5th, when 54 lbs. was obtained from it, making a total yield up to date of 138 lbs. of kuppas.

Plot No. 2, sown with Bunnee, is in extent 1 acre, 2 roods, 35 poles, and was prepared in exactly the same manner as the above, the operations being performed on the following days. The ridges were made up and the seeds inserted on the 8th June, but owing to the high temperature taking up the moisture so rapidly, the seed germinated but very indifferently, until the rains fell on the dates given above, after which they came on rapidly, and being nearly one foot high, were thinned out on the 13th July; the plants were weeded twice, on the 29th July and 31st August, and on the 8th of September the plants being on an average of 8½ feet high, had their leading shoot "topped," the plants had at this time a fine show of buds and pods, and gave promise of a good out-turn, but a great many of both were stopped off by the rain which fell on the 26th September. A few early bolls having opened, 0 lbs. of kuppas were picked on the 11th October, and again on the 6th November, 62 lbs. were obtained. The plants were irrigated for the first time on the 8th November, and repicked on the 29th November, when 100 lbs. were obtained, thus making the total yield up to date 177 lbs. of kuppas. Plot No. 3, sown with Jurree cotton, was prepared in the same manner as the above, and the seed sown 14 days later, but as the plants up to this time have produced nothing, it will be needless to give any further details of this experiment. But in addition to details given above, I would here add that each plot, previous to being ploughed, was manured with village manure at the rate of 90 maunds (of 80 lbs.) per acre. Having given details of experiments made during the past season, I here beg to add that my opinion of the ridge-system of cultivation is, where lands are liable to be inundated during the rains, a capital plan, and also in localities where water can always be obtained when required for irrigation, I believe it equally good, but in lands which are entirely dependent on the canal water for irrigation, as is the case with the farm and all experiments here, I would certainly prefer the chances of flat cultivation on the line system, not that the expenses incurred in sowing on ridges are so much greater, but simply because I believe the crops would not be so readily injured through want of moisture when grown on the flat line system, as they would be if sown on ridges, and both to be deprived of irrigation as was the case with the above experiments, for, from the setting in of the rainy season, until the 25th October (which was exactly one month from the date of the last rain that fell, and a fortnight after the first kuppas had been picked), not a drop of water was available for irrigation.

From W. N. Halsey, Esq., Collector of Cawnpur; to the Cotton Commissioner of Allahabad, dated Cawnpur, the 29th December 1871.

I have the honor to enclose the report of the Superintendent, Model Farm, on the experiments in cotton cultivation during the past season.

The rains this year have been highly unfavourable to cotton cultivation, and the situation of the land, with its defective drainage, has contributed to the failure of the experiments. So far as they go, they have been carried out with the greatest care and regardless of expense, and (short of a different climate, soil, and nature) under the circumstances nothing was left undone to secure success. I regret very much they have one and all failed to show any improvement over the native cultivators, and, as Mr. Parsons very truly says, we can detect little or no advantage from the superphosphate of lime. This was manufactured by ourselves, in accordance with a formula taken from Morton's Encyclopædia of Agriculture. We tried it both dry and in the form of liquid, and, beyond the fact that the quality of the staple is slightly less harsh, there is no appearance of the plant having derived any benefit from it. It may be the damage of rain from which we suffered, diluted it so much as to extent that the effect was [illegible] tible, but if that is the case, it is evident it is not the sort of manure to use for a rainy season crop. The best results obtained were from the ridge system at two feet apart, and I am inclined to think eighteen inches will give even a better yield. The most curious thing is the state of the Hingunghat crop on plot No. 3; it is now growing most luxuriously and is covered with bolls, which unfortunately the frosts prevent maturing. This is a defect which I have observed during each of the last three years, and I am now quite satisfied it is not suited for this climate. As Mr. Parsons has pointed out, cotton sown during the hot weather makes no progress until the rains fall, and beyond tilling the ground and getting ready for the first fall of rain, I can find no advantage in cultivating by means of irrigation. I am not aware to what extent Mr. Login has succeeded with his system of cultivation, but I shall be most happy to cultivate an acre of ground next year under his instructions and supervision, as I cannot understand how he succeeded last year and we have failed this, adopting precisely the method given in his memorandum. If we turn to the average out-turn of this district per acre, we find that, in our best plots, we are not behind our native friends, although at present they certainly have nothing to learn from us. In 1870 there were 84,261 acres under cotton, from which 48,300 maunds were collected, that is, 47 lbs. per acre. In 1871, there have been 68,443 acres under cotton, producing 39,471 maunds, equal to 56 lbs. per acre. I may also add we have a most magnificent crop of arhur, which was sown along the borders of all these fields, still to be reaped, and which I expect will keep the cattle on the farm for several months. I also enclose a plan of the land for easy reference.

From A. Parsons, Esq., Supt. in charge of Agricultural Experiments, Model Farm; to the Collector of Cawnpur, dated the 22nd December 1871.

I have the honor to forward you a report on the experiments with cotton, conducted at the Model Farm during the past season, having reference chiefly to the system of cultivation recommended by Mr. Login. The site of the experiments is situated on the north east side of the farm, and is sheltered by tall trees on the west, south, and south-east sides. The soil resembles that of the North-West Provinces generally, and may be described as a light sandy loam. Operations commenced the latter part of May by manuring, irrigating, and ploughing the land. Good farm-yard manure, made on the farm, was applied at the rate of 18 tons to the acre. The land was ploughed with English plough to a depth of six inches, and subsequently cleaned and levelled by coolies. The amount of land devoted to the experiments was 3½ acres, which was divided into eight plots, five of ½ acre each, at two of ¼ acre, and one of ⅛ acre. Plot I, consisting of ½ acre was treated as recommended by Mr. Login; ridges 4 inches in height were thrown up at intervals of 3 feet, and seed of the North-Western country cotton sown on the 5th of June, 3 seeds were sown in the form of a triangle thus ∴ 2 inches apart at intervals of 3 feet, consequently the plants before being thinned were 3 feet apart in every direction. The seeds germinated freely, and the plants were above ground by the 12th, but made very little growth until the rains set in. The plot was weeded by hand, July 4th, and plants thinned, July 14th, a second and third weeding took place August 7th and September 15th respectively.

By August 7th, the greater portion of the plants were 3 feet in height and were then "topped" which induced them to throw out several branches; these did not however cover all the ground, there being, when the plants had completed their growth, sufficient space for as many more as the plot contained. The plants commenced to bloom August 15th, but owing to the heavy rains during that and the following month, the produce of these flowers was very inferior owing to attacks from the boll-worm. The first kuppas were gathered September 30th, and was continued every 3 or 4 days up to November 30th, when the plants ceased bearing. The total yield of kuppas was 42 lbs., which gave 15 lbs. of clean cotton, or at the rate of 52 lbs. per acre. Plot II, consisting of ½ an acre, was treated precisely as plot I, with the exception of being sown a week later, and 25 maunds of superphosphate of lime applied to the land in a liquid state the day after sowing the seed. The first kuppas was gathered October 3rd, and continued up to December 10th, the total yield being 72 lbs., which produced 22 lbs. of clean cotton. Plot III, also 1 an acre, was sown June 15th, with Hingunghat cotton in ridges 3 feet apart, and 2 inches below the general surface of the ground. Superphosphate of lime was applied as in plot II the day before sowing. The plants suffered considerably from the heavy rains, through being sown too low, and generally presented an unthrifty look till the middle of September, when the dry weather set in. The plants were earthed up August 1st, and the soil between the rows loosened and levelled. The plants were "topped" when 3 feet in height, the gathering began October 17th, and ended November 30th, the yield being only 9½ lbs. of kuppas and 3 of clean cotton. At the present date the plants present a more luxurious appearance than those in the other plots, but the wea-

that it was too cold to mature the bolls. This kind suffered more than the indigenous variety from the bolt-worm, a quantity of the bolls being quite worthless, and were not gathered. Plot IV, ½ of an acre, was treated the same as plot II, but sown a week later; the gathering began October 3rd, and ended December 8th, yielding 19 lbs. of kuppas and 6 of clean cotton. Plot V, ½ acre, was sown broad-cast with country cotton, June 27th. A quantity of the seed failed to germinate, consequently the plants were much thinner than was at all necessary; 12½ maunds of superphosphate of lime was applied before sowing. The plants were not "topped" and grew to 4 and 5 feet in height. The picking began October 7th, and ended December 8th, yielding 20 lbs. of kuppas and 9 of clean cotton.

Plot VI, ½ an acre of Hingunghat, was sown June 25th, and treated the same as plot I, with the addition of being watered with superphosphate of lime, August 27th. The gathering took place from October 27th to November 30th, and yielded 20 lbs. of kuppas and 6 of clean cotton.

Plot VII, ½ an acre of North-West country cotton, was sown June 27th, on ridges two feet apart, and the plants thinned to the same distance. These did not grow so strong as those in the other plots of the same kind, but presented a uniformly medium growth throughout; the picking continued from October 14th to December 10th, and has given the best yield of all the plots, being 94 lbs. of kuppas and 28 of clean cotton.

Plot VIII, ½ an acre of North-West country cotton, sown July 2nd, was treated the same as plot VII, with the exception of not being on ridges; the plants presented much the same appearance, but have not yielded quite so much, the out-turn being 78 lbs. of kuppas and 24 of clean cotton. Appended to the report is a collated statement of the treatment and the yield of all the plots. The experiments have not proved very satisfactory: the chief cause of failure, however, may be accounted for by the rainy and general unfavourable season we had, consequently the experiments will have to be conducted another year, in order to obtain definite results. The seed in all the plots was sown too thin, which in future experiments will have to be guarded against. The advantage of sowing on ridges in rainy districts was very apparent this season, the plants so treated were more luxuriant and healthier during the rains than those sown in the usual manner. In a dry season however it would, I think, be no advantage whatever, but the contrary; the plants would then be subjected to a still greater degree of dryness. The superphosphate of lime does not appear to have produced any very marked results, certainly not in the yield; but the staple appear somewhat softened, not being so harsh to the touch as the country cotton generally is. The plants in plot I, maintained the lead all the season, but no advantage is gained by sowing before the rains set in, while there is the additional cost of irrigating the land for ploughing.

The Planters' Gazette.

BOMBAY, 21st MAY 1872.

TEA ESTATES.

It would appear that tea-cultivation is rapidly spreading in Bengal. A contemporary states that there are thirty-three companies working in the Presidency, including Assam, Cachar, Chittagong, Darjeeling, Dehra Doon, Sylhet, and other places, of which the total subscribed capital is Rs. 3,21,30,000, of which Rs. 2,34,80,100 are paid up: the balance yet remaining to meet the full amount of the subscribed capital is Rs. 86,43,900. There are 12 companies whose shares are selling in the market at premium, those of one at par, of 17 under discount, and the values of the shares of 3 are nominal. In the Madras Presidency, on the Neilgherries there are eighteen tea estates, of which four are in Ootacamund, three in Pycara, seven in Coonoor, and five in Kotagherry, the produce of the latter being much liked in London.

CINCHONA.

CINCHONA CULTIVATION ON THE NEILGHERRIES.

From Mr. McIvor's report for 1871, it appears that some of the plants which date from 1862 are now trees of 30 feet high, with stems of from 18 to 21 inches circumference. Mr. McIvor is still strongly in favour of the mossing process, by which bark taken off every 18 to 12 months is renewed and continually improved. This mode of cultivation is considered far superior to that of coppicing or cutting down the trees every eight years. Experiments with reference to the superiority of the mossing process are going on, and 51,000 lbs. of bark have been supplied to Mr. Broughton, the Government Quinologist for the manufacture of amorphous quinine. Having formed the impression that an apprehended failure of the supply of wild bark from South America was one of the leading motives for the introduction of the culture into India, we are somewhat surprised to find Mr. McIvor giving the large supplies of wild bark from America as a reason why private enterprise in India cannot prosper unless directed to the superior varieties. The red barks yield returns only after eight years, the crown barks requiring fourteen. Here is what Mr. McIvor says on the subject:—

"The bark is now being taken from the 4,000 plants of *Succirubra* and 2,000 of *C. Officinalis* (Condamania), which were mossed during last year, in order to test the value of my mossed process when applied on a large scale. The result will hereafter be reported in a separate communication. I would, however, observe that from 1,000 unselected eight-year old plants of *C. Succirubra*, 1,000 lbs. weight of dry bark has been taken; these plants will yield in October and November of this year 1,500 lbs. more of dry bark: in all 2,500 lbs. during the year, or an average over 2½ lbs of bark per tree. This bark will realise in the home market from 2*s.* 8*d.* to 3*s.* per lb., from which, deducting 8*d.* per cost of collection, carriage, &c., and calculating 350 trees to the acre, a clear profit of at least Rupee 1 per lb., or Rupees 875 per acre, will remain. Supposing the cost of cinchona cultivation at the eighth year to be Rs. 1,000 per acre, the above return will make cinchona cultivation a very good investment, especially as the yield in the ninth year will be almost equal in value to that obtained in the eighth. In the tenth and each succeeding year the yield will, in all probability, increase with the growth of the trees, and in consequence of the quality of the bark improving with each renewal. I make the above observations, as at the present moment there is a strong conviction that cinchona cultivation will not prove profitable. This conviction has caused private individuals, who have invested in the cultivation as a speculation, to withhold expenditure; consequently, private estates on the Neilgherries are generally in a neglected or abandoned condition. The above yield of bark is higher than could be expected from the average of private plantations in the eighth year. Such plantations would probably not yield more than half the quantity of bark given above, as trees from which this bark was taken were planted in October 1862, on the Government plantations, and from the first were cared for. The land was thoroughly prepared and trenched before the plants were placed in it, and from that time to the present date, the plants had every attention and care; consequently their growth has been much above the average developments, where a smaller expenditure of money and care been considered sufficient."

The want of trenching and perhaps of the drainage may account for the dying away of so many cinchona plants in Ceylon, where plants have generally been put into the ground and left to their fate. As divisions and fences for estates, it would seem that cinchona trees might be more largely used than they are at present.—*Ceylon Observer.*

CINCHONA GROWING.

Read the following letter from the Government Quinologist, Ootacamund, to the Officiating Chief Secretary to Government, Fort St. George, dated 7th March 1872:—

I have the honour, in the following pages, to communicate the results at present obtained by the action of certain manures on the trees of *Cinchona Succirubra* and *Officinalis*, growing on the Government plantations. The Government, in consequence of my suggestion, ordered that experiments should be tried with certain nitrogenous artificial manures, in order to determine whether their action would increase the amount of alkaloid in the bark of the cinchona trees to which they were applied. In consequence, ten casks of manures were ordered from England, consisting of 12 cwt. of ammonic sulphate, as prepared from English "gas-liquor," and 9 cwt. of "Peruvian Guano," both being of good commercial quality. These manures were applied to several plots of trees at the Dodabet and Neddivuttum plantations in October 1869, the trees being of various ages, and the quantities applied varying from 4 ozs. to 1 lb.

Some fine young plants of *C. Succirubra* at Neddivuttum, three years of age, were treated in November 1869 in plots of 50 each, with 1 lb. of ammonic sulphate and the same amount of guano. There were but few showers after October, and no surprise was felt at the circumstance that the trees did not in the least differ in appearance from the ordinary unmanured trees. But after the succeeding south-west monsoon, it appeared somewhat strange that no greater luxuriance of growth was apparent. The trees, even during the rains of 1871, preserved still their ordinary appearance, and I thought it remarkable that these ordinarily stimulating manures should so entirely fail in their effect on the cinchona trees. It was not until the autumn of 1871, that any change was perceptible; but at that time it appeared to me that an increase in the depth of tint of the leaves and a somewhat greater luxuriance was apparent among the trees, manured with ammonic sulphate. The difference, however was slight, and I was informed by Mr. McIvor that no difference was perceptible to him. I certainly perceived no change in the growth whatever in those trees which had received less than 1 lb. of the manure. In January last, the time appeared to have arrived at which it was desirable to examine analytically the quality of the barks. The following statement gives the amounts of alkaloid obtained, calculated in percentages of dry bark; compared

with a sample of bark taken from trees of same age, growing near, under conditions which only differed by the absence of manure.

	Manured.	Unmanured.
Total alkaloids	7·25	4·89
Quinine	3·45	1·72
Cinchonidine and Cinchonine	4·80	3·11

I thus found somewhat to my surprise that the manure had caused an increase in the alkaloids to the amount 2·36 per cent. of which 0·67 consisted of quinine. A similar examination was conducted with the trunk-bark of the trees which had received 1 lb. of guano. The comparative results are expressed in the same manner as the above :—

	Manured.	Unmanured.
Total alkaloids	5·29	4·76
Quinine	0·91	1·04
Cinchonidine	4·38	3·72

From these analyses it is evident that the guano had produced an increase of but 0·53 per cent. of total alkaloids, and that the manured bark contained 0·13 per cent. less quinine than the unmanured. The less of guano, when compared with that of ammonic sulphate, is contrary to what would be expected *a priori*. The conclusion I derive from these experiments with *C. Succirubra* is, that as the gain in the most successful case consists mainly of alkaloids other than quinine, it will not be profitable henceforward to manure this species, even with ammonic sulphate, as the cost of such manure may be as great as the increase in the commercial value of the bark. The fact of the gain in alkaloids is, however, a result of much interest.

I have had occasion in the report noted in the margin and in many subsequent reports, to mention the great sensitiveness with which the crown-bark trees are effected by situation, sun-light, and character of soil; and have taken the opportunity of expressing my conviction that *C. Officinalis* was the best adapted for high cultivation. Hence I naturally anticipated that the influence of manures on this species would be marked, and would result in a considerable increase in the amount of alkaloids contained in the bark. The considerably variations which occur in the bark of this species from apparently slight causes, necessitated much care in experiments in which the influence of manures was to be investigated. Hence in an apparently homogeneous plot of *C. Officinalis* long double rows were selected in which to try the effect of the manures, while the trees between these double rows were left unmanured.

In October 1869, the manure was applied in amounts of 1 lb. and ¾ lb. of each to a tree. Smaller amounts were also used, but were applied to younger trees. The trees to which the larger quantities of manures were applied were of the same age as the trees of *C. Succirubra* at Neddivuttum, or were, in 1869, of three years old. Several heavy showers fell after the manuring took place, and it was with much surprise that I could perceive no change had taken place in the growth of the tree. Since the above date no improvement whatever has been perceptible in the manured trees over the immediately adjoining trees, which have been unmanured. As the trees of *C. Officinalis*, which yield the finer barks, are nearly always of more vigorous and luxuriant growth, I for a long time concluded that the views I formerly held were wrong, and that the experiments with manures would yield negative results only. In February 1872, no difference was to be distinguished between the manured and unmanured trees, and they were only to be recognized by the posted labels which marked them. The trees which had received 1 lb. of guano gave the following percentages of alkaloid in the dry bark. The analysis of the unmanured bark is also attached for comparison, a mean specimen of each being carefully collected for that purpose:—

	Manured	Unmanured
Total alkaloids	6·51	3·98
Pure quinine	1·11	2·40
Cinchonidine and Cinchonine	2·10	1·30

Hence it appears that the 1 lb. of guano had increased the total alkaloids in the bark by 2·53 per cent., of which increase 2·01 was quinine. It was with great vexation that I found that the stake, which carried the label which marked the trees that had received the 1 lb. of ammonic sulphate, had been taken away during the last three months of 1871, and that no mark remained by which the trees could be distinguished. Hence to ascertain the effect of this ammonic salt, I had to take trees which had received but ¾ lb. of the manure. The contents of the dry trunk-bark in alkaloids is expressed as follows :—

	Manured.	Unmanured.
Total alkaloids	5·76	4·54
Pure quinine	3·11	2·54
Cinchonidine and cinchonine	2·65	2·00

The addition as manure of ¾ lb. of ammonic sulphate had thus produced an increase of 1·22 of total alkaloids, and 0·57 of quinine. In 1867 during the absence of the Superintendent of the plantation in England, I requested the Acting Superintendent Mr. Batcock to apply stable manure to six average trees of *C. Officinalis*. On the return of the Superintendent, Mr. McIvor continued the application of a barrow-load of pig-litter or bullock-manure every six months as commenced by Mr. Batcock. More lately, owing doubtless to the frequent changes made in the subordinate superintendence of the plantations, this manuring has been carried with great irregularity. On the whole, each tree has probably had three applications, and at the most but four. As no improvement was perceptible in the appearance of the trees, none has been applied during the last eighteen months. In February 1872, specimens of bark have been taken from four trees, and at the same time the bark was taken from several unmanured trees growing under the same conditions and immediately adjoining. The analyses are as follow :—

	Manured.	Unmanured.
Total alkaloids	7·89	4·89
Pure quinine	7·15	2·40
Cinchonidine and cinchonine	0·74	2·49

Hence there has been a singular improvement in the quality of the bark. The total increase in alkaloids has been 2·81 per cent., but the manure has also had the singular effect in causing the alkaloids to be *quinine*, instead of cinchonidine and cinchonine. Hence the total increase in pure quinine is no less than 4·75 per cent. Hence the bark has been at least doubled in value in the English market, and the gain or difference in value in English money may be estimated at the present time to be 2*s.* 6*d.* per pound of trunk-bark. This estimate does not take into account the fact that this manured bark yields quinine sulphate sufficiently pure without the cost of the separation from the cinchonidine sulphate; and hence is of less expense in quinine manufacture. In nearly every case in which the action of farm-yard manure has been compared with the more artifical manures, it has been found to have somewhat the superiority. Although in the above experiment it has had the advantage of a longer time of action, this superiority still is evident. The only perceptible change which appears in the crown-bark trees by these nitrogenous manures consists in the increased yield of alkaloids. There is no greater luxuriance of growth apparent, and it is only by analysis that a change is detectable in the bark. This result appears to me strongly to corroborate the hypothesis that it is by supplying the elements of the alkaloids in an appropriate form that the increased yield is produced. I have long been of opinion that the alkaloids in the bark of the trees are not specially active constituents in the processes connected with the life and growth of the plant, and this supposition is supported by the circumstance that the increased amount of alkaloid produced by the manure causes no change in the appearance and rate of growth of the tree*. It is thus to be remarked that the action of manures on cinchona is peculiar, and specially supports the above hypothesis. It would be quite intelligible from the well-known action of manures upon growing plants that an increased growth of bark would be obtained. But this is not the result with cinchona; a larger yield is not obtained; but certain constituents of the bark are increased in quantity. That there is a certain similarity in composition between some constituents of the manure and the alkaloids appears thus a fair conclusion. The addition as manure of 1 lb. of guano to a tree of *C. Officinalis*, as reported above, has caused an increase in the value of a pound of bark that may be moderately estimated at the present time to increase its market-value by 1*s.* 6*d.* per lb. The cost of the guano bought in England, with that of freight, insurance, agent's commission, and carriage to the hills, cost 2½*d.* per lb. It thus is evident that even employing guano, obtained at by no means the lowest cost, as manure to *C. Officinalis*, the profit is certain and considerable. It is furthermore probable that the maximum effect of the manure has not been arrived at in the foregoing experiments, since it is unlikely that the period of greatest yield would be hit upon by chance in the first trial.

It thus appears to me that the action of manures promises a new direction in which the cultivation of the cinchona alkaloids can be still further improved. I should mention that the quinine obtained from the manured trees readily yields its normal, or nearly theoretical amount of crystallized sulphate. As the analyses were not made for a commercial purpose, the amount of crystalline sulphates has not in every case been determined. There are some plots of younger trees whose treatment with manure has hitherto purposely been in smaller amount than those whose examination forms the subject of the foregoing. I am of opinion that a further small quantity of manure should be obtained from England for the further treatment of these young trees, and for certain experiments suggested by the foregoing. The manure can be procured out of savings in my next year's budget. Whether the application of manures should be carried out to a greater extent than these experimental plots Government will decide. I would recommend that *C. Officinalis* be the species to which it should be applied; and that if stable manure, as is probable, cannot be obtained in sufficient quantity, guano should be the manure used.

COFFEE.

YOUNG CEYLON.

It is a common idea that coffee planters lead an easy life, involving no greater toil than a stroll, morning and evening, around their estates. This may be the case in highly civilised districts,

* Mr. McIver informs me that he has greatly stimulated the growth of young plants on poor soil by manuring them with cow-dung. No stimulus was, however, as has been stated, apparent in the cases to which this report refers.

which have been a long time under cultivation; but those pioneers who break ground in "fresh fields and pastures new" could tell a different tale. When the rivers are flooded, the solitary planter is sometimes, for weeks together, cut off from all intercourse with his nearest neighbour, and subsists on vegetable curries, and preserved meats. Not seldom the "beef coolie" loses his life in the attempt to bring his master supplies from the bazaar; and when the last fowl has been eaten, the last sardine fried, and the last tin of sausages consumed, the famished planter calls for his trusty nag, buttons on his gaiters, wraps his body in a mackintosh, and sallies forth to brave the elements. Courage and indifference to personal danger are the marked attributes of the coffee planter and any stray specimens of the genus "cad," very soon find the country too hot for them, or become loafers at the way-side inns. Superficial travellers, like Sir Charles Dilke, (of whom a London paper remarks that it is possible to be a baronet, without being a gentleman) who take a twenty-four hours' scamper from Kandy to Newera Ellia, have been known to form their opinions of the planting community from these rest-house parasites who are ever ready to beg a dinner, or borrow a rupee; and thus have been led to write most disparagingly of an honorable body of men. Within the last ten years there has been a considerable influx into Ceylon of young men, educated at the great public schools, and Universities, with a little capital varying from £2,000 to £5,000, who have done much to elevate the tone of society in the Central Province. As a rule, these young men do not take kindly to Colombo, with its petty cliques of Government employés, Bankers, and Merchants, its colonial stiffness and reserve, so irksome to youths accustomed to the free air of the mountains. When in search of relaxation they betake themselves to the pleasures of the chase, tracking the elephant in the primæval forest, hunting the cheetah amongst his native precipices, chasing the deer on the vast prairie table lands called *patenas*, and sometimes descending to the low country in the neighbourhood of Trincomalee and Batticaloa, where large game of every sort abounds. Once or twice a year these youths make a raid into the mountain capital, where they waken the échoes of the old hills, and startle the bosom of the Kandy Lake, with the refrain of "Champagne Charlie." Such occasions are rare, however, happily for the peace of mind of the quiet Dutch Burgher families, and are only indulged in when district meets district to try the tug of—cricket, in the neighbouring town of Gampola, or on the Kandy green.

What are the prospects of such young men, the reader may enquire? They are good indeed, one might say brilliant, and in all human probability, if blessed with good health, they will have attained independence by the time they reach middle age. On his arrival in Ceylon the youth takes up his abode with an acquaintance of some years' residence in the Island, with whom he learns the rudiments of his trade, including the Tamil language, in order to be able to converse with his coolies. In some cases he is at once installed in the post of Assistant Superintendent, for which he gets his lodging and board, or, if he prefers it, £8-0-8 per month. While learning the arts of holing, lining, planting, handling, &c., the beginner keeps a sharp look out after the sales of forest land, which take place at the Government Agent's Office in Kandy, at frequent intervals. He has made up his mind to settle in one of the new districts, say Dimbula, Dickova, or the Maskelliya Valley; the identical quarter he has chosen has been applied for, surveyed, marked out, and the auction is advertised in the *Government Gazette*. Our planter rides into Kandy on the appointed day to attend the sale, when there is a brisk competition ending by Lot 4,803, bounded on the north by Lot, &c., and measuring 410*a.* 3*r.* 2*p.* being knocked down to him at £4-10 an acre. The price varies according to the run of popular taste for the moment, land going in some districts for the upset price of £1 an acre, while a block, perhaps inferior to it in coffee-bearing qualities, fetches £5, because it happens to lie in a locality where one or two lately opened estates have enriched their owners. However, such considerations are very far from troubling our friend, who makes a night of it in the Queen's Hotel along with the other purchasers, and rides home to his bungalow next morning with a bad headache, but the happy owner of a "wattle" in embryo. It is only a speck in the ocean of forest, but in anticipation it has already endowed its owner with the wealth of the De Soyzas, the princes of Cinghalese coffee planters. Life would be a poor affair without its day-dreams, and the planter is but one of the many who start on their career, with a belief in their certainty of success, which greatly aids them in reaching the goal. It would be better for a man to dig for diamonds in South Africa, or plant cotton in the Fiji Islands, than to commence coffee planting, dispirited and mistrustful of himself. The first sharp attack of dysentery, or liver, will carry such a man off as surely as a buoyant heart of the other will enable him to bear hunger, cold, and isolation without repining, as well as to resist the insidious attacks of disease.

Having secured his block of land, the next thing the planter must do is to engage a Cinghalese contractor, who undertakes the felling and clearing of any 100 acres as a beginning. When this has been done, and a good "burn" is disposed of the dead leaves and branches, the real work commences. If the land is not too far removed from a neighbouring estate, the new man can clean with its Superintendent and ride to and from his own place. Generally, however, there is no help for it, but to rough it in a hut made of leaves of the Talipot palm. In a new district where Government has not had time to trace roads, or build bridges, he may pass weeks without seeing a white face. The following extract from the letter of a Dickova planter, under date the 27th November, will serve to illustrate the difficulties attaching to his new position:—

"I had a very narrow escape from being drowned last week, but I had 'the pleasure of saving a man's life (old J. S. whom you must remember 'on D—estate). Four of us were crossing a large and deep river in the 'Maskelliya, swimming with all our clothes on. I got over first, then 'B—; but S—struck half way, and was drowning. I and B jumped in, 'and made for him. He had got entangled, and we could not get him 'loose for a long time. B then gave in, and I was left alone. S was 'by this time nearly insensible. I was quite exhausted when a Cinghalese man came to my help, and then I let go and drifted down. I fortunately struck against a dead stump and caught hold of it, just as the 'native and L.'s insensible body were sweeping past me. I caught hold 'of them and held them till we were all landed ashore. S was a long 'time before he came round. It gave us all an awful fright."

The Maskelliya, where this occurred, is the most recently opened district in the island, and forms part of an immense tract of forest, lying under the shadow of the sacred mountain, and hence named the Wilderness of the Peak. Except once a year, when pilgrims from the Saffragam country wend their way through it by devious and uncertain paths up to the "holy footprint," these vast solitudes are never trodden by man. The crack of the rifle has not as yet driven the elephant from his lair, nor startled the cheetah from his den in that awful wilderness. The Ceylon Government is not remarkable for its promptitude in giving roads to fresh districts. This seems rather like a breach of good faith on its part, for, when land is put up for sale, it is understood that Government will lose no time in giving it a grant-in-aid road—that is to say, a road, of which half the expense is borne by Government, and the other moiety by the planters. Through this tardiness many a noble fellow succumbs, or goes home invalided, from being deprived of timely medical aid, and nourishing supplies. That the fault is not Sir Hercules Robinson's, will be borne witness to by every up-country resident, but rather to the circumstance that the trail of the serpent has reached "India's utmost isle." The Parent Circumlocution office sends out its off spring who never completely get clear leading strings, or forget their early training. Sir Hercules of their has been emphatically the planter's friend, and for the extension of the Railway from Peradinia to Navalipittin alone, he deserves a statue erected on the highest mountain in the island.

We left the new land owner shivering in his Talipot hut, his servant having just stated that the wood is too damp to admit of a fire being kindled to make early coffee, adding *sotto voce* that there was no milk, that the sugar was all melted, and the bread coolie not arrived. "Heaven's own consoler" tobacco alone remains: so lighting his pipe the hungry youth proceeds to *line* his 100 acres, and having marked with pegs the spots where the young plants ought to go, the coolies dig the holes. All this is not very difficult work, and when the necessary plants have been put in, there is little or nothing to do on the plantation, until next year's clearing, and planting afresh 100 acres. To give some idea of how capital may be expended, the following may be relied on as a fair estimate:—

Cost of Land 350 acres at £5 .. ..£1,400

First Year.		*Second Year.*	
Nursery	£ 15	Nurseries	£ 5
Felling, clearing 100 acres ...	225	Holing and planting	10
Holing and planting ..	120	Weeding	100
Weeding	100	Roads and bridges . ..	10
Lines for coolies .. .	50	Tools . . .	5
Roads and bridges . ..	50	Sundries	10
Tools	15		
Miscellaneous	20		
Total, first year	605	Total, second year .	140
		Grand Total, first and second years	745
Felling, clearing, planting, &c., another 100 acres as before . .			605
			£1,350
		Total expenditure..	£2,750

to those who have further capital, the rest is plain sailing. They have only to fell the remaining 150 acres, and in the meantime erect a bungalow, store, and pulping house, as also to perfect the roads, and when all is in full bearing, they are the lucky owners of an estate worth from £12,000 to £14,000, giving an income of £3,000 a year at least.

But such as have no more capital at their disposal must set about financing. There is plenty of money always seeking investment, and the planter can borrow on primary mortgage of his estate, at nine per cent. per annum. His property is now worth—

100 acres planted	..2 years old, at £24 to £2,400	
100 „ do.	..1 year	600
150 „ do. Forest now worth £6		900
	Total..	£4,100

on this he can raise £3,000, which will pay for the buildings, and opening the remaining land. One or two crops will pay off the debt, and then the proprietor is in as good a position as his brother capitalist. In the preceding estimate no charge has been made for superintendence or interest of money. In the case of a middle-aged man—or a retired Indian Officer, who has a family, and objects to roughing it in the jungle, he would probably wish to purchase a plantation in full bearing. His views will be met without difficulty. One enterprising Agent in Kandy advertises:—

"Coffee estates for sale in all districts, ages, and condition, varying in size from 40 to 1,500 acres—and in price from £200 to 24,000.

N.B.—56 estates now on the register—35 have been sold."

Supposing an estate of 350 acres is selected, and the price fixed at £10,000 (there being 50 acres in forest): the purchaser pays down all the money at his disposal, say £3,000, and leaves the balance on a primary mortgage at 9 per cent. There still remains the difficulty of finding money to work the estate, to gather the crop, and dispatch it, as well as for his household expenses. Here the local Exchange Bank steps in, and advances the needful at 8 per cent. on what is styled a *Cash Credit*. By their charters, the banks are prohibited from advancing money as security of land, or *Block advances*, which brought the old Bank of Ceylon to ruin; but no such restriction applies to lending on *crops*.

Here it may be remarked that Ceylon is rather ahead of India in the matter of banking, as from its insular position it has been able to copy the Scotch system. Every little town and village has got its Branch Bank, which keeps current accounts, and negotiates drafts on Colombo, but principally cash notes, which are of all denominations from Rs. 100 to Rs. 5 and are an immense convenience. It must not be imagined, however, that the *cash credits* above alluded to bear the faintest resemblance, except in name, to Scotch ones. In that country—when a person requires funds, he applies to the Bank, which grants him the amount on the security of a bond, executed by him jointly with two or more individuals of respectability and substance. Beyond a fair rate of interest for its money, the Bank derives no advantage from the bond, and the parties who became joint surety, obtain actually no benefit at all, having given their names out of pure friendship. The Ceylon cash credit is quite another affair, and shows considerable ingenuity in its construction. The coming crop having been estimated by a competent judge, the amount of advance is fixed considerably within its probable value, and a bond is signed by the planter and his Colombo agents, by which the former undertakes to consign all the produce to the latter to be cured and shipped. The agents in their turn engage to hypothecate to the Bank the bills of lading for the coffee when shipped, drawing against the same on their London correspondent at the rate of exchange of the day. The Bank thus employs its deposits without risk, and does a profitable exchange business on London; the Colombo agents make sure of their commission for curing and shipping; and the planter gets his money at 8 per cent. Judging from the immense improvement visible of late years in Colombo, where the dingy hovels in which the local millionaires amassed their fortunes have given place to palatial edifices all plate glass and stucco, it cannot be urged that the arrangement is unprofitable to the agents at any rate. To the Banker considerable discretion is left, as he can fix the rate of exchange at pleasure: but taking the Bank's drawing rate in Calcutta for six months' sight bills on London, as the central pivot round which all his operations must revolve, it will be found that the planter is fairly dealt with, and does not pay more than 2 or 3 per cent. above that rate.

Young Ceylon is the title of a rather interesting little pamphlet on coffee planting in Ceylon, with which we have been lately favoured. The natural beauties of Ceylon, and the seductive character of its climate, everyone has heard of: and these, with the known fertility of its soil, form strong attractions to the many poor men at home, who would like to make their fortunes in an easy way and in a short time. Such men, however, we are glad to observe, it is not the wish of our pamphleteer to attract. Mr. Anderson gives a very clear statement of what a coffee planter has to undergo on beginning his career; and these difficulties, even with all the advantages of a good climate and soil, are of a nature to discourage greatly any but hard-working men. The first necessity for success, of course, is a little capital, say two or three thousand pounds, with which the young planter, after having obtained some experience as an assistant on another estate, can begin by clearing a couple of hundred acres purchased by Government at one of its auction sales of forest lands. This little capital, however, is insufficient for anything but a beginning, and to ensure success, more money must be raised: this however being easily obtained, at a fair rate of interest, by the planter, and his Colombo agents becoming joint securities for a loan from one of the local banks. With this loan, which he should be able to clear off in a few years, he will soon create for himself a valuable property, yielding a good income, and one which, if he wishes to retire, he will easily be able to dispose of.

The chief difficulty in the way of coffee planting is the want of roads. On purchasing an uncleared estate, there is an understanding that Government will pay half the cost of a road towards it; but the delay which usually occurs in constructing it is the occasion of much serious inconvenience to the planter: both from the expense of transporting his produce, and because he is almost entirely cut off from his neighbours, and in the case of sudden illness from all medical assistance. Mr. Anderson pays a tribute to Sir Hercules Robinson's earnest endeavours to assist planters in this matter. Ceylon appears to be afflicted with a species of loafer which excites Mr. Anderson's just indignation. These loafers are principally men who have attempted coffee planting with no capital, or come out to the island vaguely on speculation; and it is from this class that the "Citizen Baronet," Sir Charles Dilke, and many others, take their ideas of coffee planters. As in every other profession or trade, there is no golden road to a fortune in coffee planting, and if Mr. Anderson's little pamphlet succeeds in convincing the public of this, and so preventing the importation of loafers, he will have done good service to the island. We should be glad to see from the same pen some notice of the method of cultivating coffee in Ceylon, and the particular dangers to which it is exposed, along with more exact information as to the average return on capital expended on an estate. It would be a fit supplement to his first pamphlet.—*Pioneer.*

COFFEE AND TEA IN THE UNITED STATES.

In the fiscal year ended 30th June last, the value of coffee imported into the United States is given at 31 millions of dollars, gold, say £6,500,000. This is nearly a million in excess of the imports of coffee into Britain, with the grand difference that America imports to *consume*. The figures for tea in the case of the United States are not much more than half those for coffee. They are 17½ millions of dollars, say £3,600,000. The tea is also consumed. On the two articles the Americans spend—

Coffee	£6,500,000
Tea	£3,600,000
Total	£10,100,000

Adding duties, profits, &c., we may safely say 15 millions sterling, and we know that the rate of consumption, especially as regards coffee, is rapidly increasing.

The British people consume tea to the value of at least twelve millions sterling, and coffee to the extent of 1½ millions more, an aggregate of say 13 millions against the 10 millions of the United States.—*Ceylon Observer.*

THE PROSPECTS OF THE COFFEE TRADE.

There appears to be the prospect of splendid crops in all the coffee estates, both in Ceylon and in Southern India. The intelligence from the Ceylon districts is that the out-turn of coffee will be a good one in the ensuing season, and we hear the same thing from the Wynaad, Travancore, and Cochin estates. In some places in Ceylon, the next out-turn is expected to be double that of the last season. And when it is considered that the exportation of coffee from Brazil has considerably decreased in production, the coffee planters in India and Ceylon might well anticipate very good results from their undertaking for the future. Of the cause of the decrease of cultivation in Brazil, a Ceylon contemporary writes:—"Most conflicting accounts reach us respecting the condition and prospect of the planters in Brazil. The latest is of a most doleful character, representing the planters as over-head-and-ears in debt, the best lands used up and a crash impending in connection with emancipation. That the effect of emancipation will be for a long series of years at least to prevent increase of production seems certain."—But even if Brazil be able to produce as much coffee as she had hitherto yielded, there is no doubt that all would be absorbed by the United States, whose demands are daily becoming greater. In one year, the value of coffee imported into the United States amounts to about six-and-a-half millions of sterling money, and as the population of the States is rapidly increasing, the supply must proportionately increase. By the abolition of all duty on coffee by the Government of the United States, the trade now maintained by Brazil in the article with Europe will be diverted; and India and Ceylon coffee will not have to compete with that from Brazil in the European markets. It will pay better to the Brazil planters to send their coffee to the United States, now that duty has been abolished, and the European markets will be open to the Indian and Ceylon produce, free, as we have stated, from all competition. But the future prospects to coffee-growers in India and Ceylon are brighter than the above circumstances appear to indicate. In England, the duty on coffee has been reduced to one-half,—that is, from 3*d.* to 1½*d.* per lb. In regard to the recent reduction of duty by the British Government, it is observed as follows:—"At length coffee will have fair play in the British market, the duty being reduced 50 per cent., or from 3 to 1½*d.* per lb. The corresponding reduction in chicory is in accordance with a policy which we cannot alter. We were never amongst those who hoped for the total abolition of the coffee duty. The article

is one of a class that the greater the consumption is encouraged by a lowered duty, the more valuable will be the revenue in cases of emergency. If all goes peacefully and well, we think a further reduction in the penny per lb. may be calculated on." There is nothing to fear that things will not go on smoothly, for war with Ashantee or any other Power is not probable, and we may expect a rapid development of the trade in coffee of India and Ceylon with England and the European ports.

Although England does not import as much coffee as the United States receive for their own consumption, the rate of consumption in the United Kingdom is increasing. This is indicated by the larger quantities of the article which are going forward. The shipments of coffee from the ports of Malabar to the United Kingdom have been for the last few years, unprecedently heavy. From Ceylon large quantities have likewise gone forward to London. The reduction of duty on coffee to 14 shillings per cwt., combined with the increasing demand for the article, will give, we have no doubt, an extraordinary impetus to coffee growers in India and Ceylon. For the difference to the proprietor of a 200 acre estate will now be about £700. Let us suppose that the average production of one acre of land is 5 cwts., and we find that by the reduction of duty, the planter gains about £3-10 per acre. Altogether, we may look forward to great activity in the coffee trade, and the prospects to the coffee producer and the merchant are very bright indeed!

We are inclined to think that capitalists will now find better inducements to invest their money in coffee cultivation. There are waste lands available in Travancore and Cochin for the purpose. The facilities afforded by the Governments of the two States to encourage the production of coffee are great, and we hope to see that, with a bright future to planters, the cultivation of coffee on the Travancore and Cochin hills becoming extended.—*Cochin Argus.*

THE COFFEE DUTY.

One item in Mr. Lowe's Budget may be taken as opening out a gleam of sunshine on the coffee-growers of Southern India. It has long been matter for wonderment why the customs duty on coffee, so much of which comes from English dependencies should not have been lowered to something like a fair proportion with the reduced duty on tea and sugar. That source of complaint will now be done away, and coffee, with the duty on it reduced from 28s. to 14s. a hundred-weight, and from 4d. to 2d. a pound on roast coffee, will have a fair chance of competing with its more popular rival, tea. Hitherto, as Mr. Lowe remarks, its history has been a melancholy one. Last year the consumption of this harmless stimulant amounted only to 1·3 lb. a head, exactly the same figure at which it stood in 1855. In 1860 it had even fallen off to 0·4 lb. a head. The reduction of the duty from 50 to 25 per cent. ought, in the usual course of things, give a new impetus to the demand for a beverage so cheering, as Mr. Lowe reminds us, to the people who frequent the coffee-stalls in our streets on the way to their morning labours. Nor does our astute Chancellor forget the increased consumption of sugar involved in any increased demand for the fragrant berry. It is to be hoped, however, that the concurrent lowering of the duty on chicory will not tend to lessen the value of the boon he would confer on the growers and drinkers of pure coffee.—*Home News.*

TEACHING THE QUEENSLANDERS TO GROW COFFEE.

This task, we observe, is undertaken in the columns of the *Queenslander* by a former resident in Ceylon, Mr. James Ferguson, (no relation or connection, we may be permitted to say, of the conductors of the *Observer*). The "observations and instructions" are divided into heads as follows:—

1st.—As to the selection of land.
2nd.—Preparations of land for nursery.
3rd.—As to seed and mode of sowing.
4th.—Treatment of seedlings.
5th.—Preparation of land for coffee field.
6th.—Mode of transplanting.
7th.—Drainage and pruning.
8th.—Picking berries and preparation for market.
9th.—General remarks.

The only portion that calls for quotation is the following paragraph:—

"It may be well here to make a few remarks on the advisability of utilizing the spaces of ground between the rows of coffee trees during the first two years whilst they are growing; but in so doing caution must be used not to plant anything between the coffee trees of a nature likely to absorb the moisture and goodness from the plants, or which may be likely in any way to interfere with their growth. In a work already published containing a treatise on coffee, it has been suggested to plant bananas, not only for the purpose here referred to, but also as a shelter; and in another work treating on the same subject, Indian corn, Angola peas, Palma Christi, or castor oil plants are recommended; but I strongly object to all these except maize (or Indian corn); and perhaps the peas may be used if they are so grown as to prevent the possibility of their interference with the coffee trees. The other plants mentioned are decidedly objectionable as likely to draw too much nourishment from the ground; and, with respect to the castor oil plant, it is of a straggling spreading nature, and would in time become entangled with the coffee trees, and injure them materially, or occasion great labour and consequent expense in keeping them within bounds. Again, when once the castor oil plant is admitted into the ground, it is very difficult to get rid of it, in consequence of the seed dropping about. Maize may be safely used for the purposes named, or any other quickly-growing and quickly-producing crop may be used, provided it be not of a nature likely to impoverish the soil for the coffee trees, nor likely to entangle or in any way interfere with them."

Why the writer thinks that maize or peas would not exhaust the soil, we cannot well see. We suppose that the very elements required for corn of any kind or for legumes would be the identical elements necessary for coffee. We should doubt if rain is equably enough distributed over the year in any part of Queensland to suit coffee, but the experiment is worth trying, that is, if the labour difficulty can be overcome. At present enough of labour cannot be obtained to meet the demands of cotton and especially sugar planters. There are many portions of the world in which coffee can be grown where it cannot be grown profitably.—*Ceylon Observer.*

COFFEE.

The cup that cheers, but not inebriates, may be equally said of coffee as of tea, and those who have any interest in plantations of either kind will be glad to know that the consumption of both in England is immensely on the increase. The import of coffee for 1871 amounted to 192,002,132 pounds against 179,901,864 in 1870. Tea import was 170,716,140 pounds in 1871 against 141,020,767 in 1870. The *Ceylon Observer* complains that coffee is not the staple drink of the English people as it is of the Dutch who consume 13 pounds per head per annum, while the English do not consume a pound. In order to remedy this, it is thought that "a free breakfast table"—in other words a remission of duty on such articles—would enable working men to repudiate gin drinking, which is doubtful; although any means of promoting the sobriety of the working classes should be welcomed.

Notwithstanding the care taken, the prospects of the coffee planters are not so brilliant as was expected owing to causes difficult to contend against. The *Indian Statesman* sometime ago gave a review of the state of the coffee plantations in Coorg, and amongst them noticed a few remarkably productive. One is the Pallay Batta estate which is said to be extraordinary, a crop of 350 tons being expected from 400 acres; some of the oldest trees giving at the rate of a ton per acre. But this is an exceptional estate, and planters consider the product good at the rate of 10 cwt. per acre: most giving not more than 7 or 8 cwt. A correspondent of the *Mail* demurred to "estimates" of crops, as they are often very deceptive, and asserted that the prospects of the planters are worse than ever. We may here take occasion to observe, with reference to the cess of 2 rupees per acre which is now complained of, that we do not think the planters have much reason to murmur, because this tax was their own choice in preference to the Halat duty. Further—until about 1861, planters obtained large tracts of land at a peppercorn rent, and amongst them many adventurers who had not the means, nor ever could obtain the means to bring into cultivation the lands thus surreptitiously applied for. They obtained them with the view of turning an honest penny at a convenient season; and many obtained good sums for what they had never paid a rupee in any way.

It is one comfort however that the demand for coffee is increasing, wherever it may eventually go. Ceylon supplied 98,000,000 pounds: and India 10,523,000 pounds, nearly the whole of which was produced in the Mysore districts. We observe that *The Grocer* gives 180,000,000 pounds as the quantity imported; the *London Daily Recorder* gives the quantity we have quoted above. From the latter authority it appears that the consumption has fallen from 1¼lb. per head to less than 1 pound. This must be laid to the account of the variety of spurious imitations of coffee which find their way into the market. These are not offensive and they are nutritious, and as Mr. Bright asserts that such imitations are justifiable, it is not likely there will be any law evoked on behalf of the planter.

Some late experiments of coffee are worth noticing. Of course it is known that coffee has great power in retarding waste of the tissues, dispelling the sensation of hunger, and is a powerful exhilarant. It gives to the weary increased strength and vigour, and imparts a sensation of comfort and repose; none of which effects are occasioned by its substitutes. Coffee contains a volatile oil, and it has been found that by distilling coffee with water, this oil passes over suspended in the vapour, and if these liquids are condensed and drank, all the effects, as regards the physiological properties of coffee, are produced. That this oil is the representative of the chief properties of coffee was proved by the same effects having been caused by the oil obtained from two ounces of coffee, as would have resulted from an infusion of a similar quantity of

coffee. This oil is formed by the action of heat on some particular element, but it has been found to be capable of generation by some independent molecular process, for a *long kept* inferior coffee, on being roasted, presented all the choice characteristics of the finest Mocha; a fact that dealers in the article might do well to remember.

We shall take the opportunity of making a remark upon peaberry coffee. Mocha coffee is of small size, and it seems to be intended that an inference should be drawn that the peaberry being of small size likewise, it bears an approximation in value to Mocha. We have had an opportunity of seeing this berry, and we are disposed to look upon peaberry coffee as nothing more than gabbled stunted imperfect coffee berries, and really inferior to common coffee for that reason.—*Bangalore Spectator.*

CEYLON PLANTING PROSPECTS.

(Ceylon Observer.)

PLANTING prospects were never apparently brighter than they appear to be at present for the coming season. If the coffee crop of 1872-73 does not fulfil the expectations so long associated with the proverbial "next year," then the planter may well consign that will-o'-the wisp term to a limbo of myths. From every part of the Hill-country we have the same cry of bumper crops, and, notwithstanding the unusually good blossoms which set at an early period, there have been further successive displays until in some districts, between berries already forming, blossom set and blossom just coming out, it would seem as if the trees could not possibly carry more in the estimation of the most selfish of cultivators. Nor is this grand show confined to young coffee: part of the finest which has come under our notice was found on trees over a quarter of a century old, the result of careful, liberal cultivation. The latest report as if to crown those from more highly-favoured districts, comes from the Doombera Valley, which, for the last few years has but ill-rewarded the attention paid to it. The fitting season even for Doombera, however, seems at length to have arrived and the magnificent trees growing on its limestone soil are said to give promise of a bumper return. The alarm has already been taken up with reference to a sufficient labour supply to gather all the fruits of this liberal harvest, and we hear of special advances being sent to the coast of India, to secure an extra number of hands on several estates during the critical crop season. At present, the supply of coolies is of course more than sufficient; and we are glad to understand that many planters have made work for their labour force—in felling forest, cutting roads, extra manuring or draining—in order to keep on men whose presence will be invaluable during the approaching busy picking of crop, and whom, if paid off, it might be found impossible to replace. We have never yet experienced a crop season in Ceylon in which there was not some one or other element of success wanting to the planter. Insufficient crops form of course the most frequent complaint; but in years when the crops were satisfactory, there was certain to be a scarcity of labour, a dearness of transport, low prices or scarcity of money, which are we to experience in 1872-73? The crops, as we have said, promise to be all that could be desired. Money is most abundant; and the day seems fast approaching when, what between the agency of the telegraphs, rapid transport of crops by canal steamers, and perhaps by-and-bye through Railway communication between Europe and India, this colony will come to be viewed in the London market much as the Channel Islands are now, and money for investment become available on as easy terms as there. The announcement has been made during the fortnight by the local agents of a well-known London House, that advances may be had to meet the current expenses of estates till crop-time, on the security of the crops, at the unprecedentedly low rate of interest (for Ceylon) of five per cent. Nor do the terms otherwise interfere with the planter's freedom to sell his coffee in the local market, should he so elect. It is evident therefore that scarcity of money cannot be the drawback during the coming season. Nor can we see that a fall in prices to any appreciable extent need be feared. There is every sign rather that not only will the present favourable rates be maintained, but that they will be probably exceeded during the remainder of the year. With the further relief afforded by the Railway being opened to Gampola, in prospect, and with the generally satisfactory condition of the roads through the coffee districts, it is unlikely that the transport difficulty will re-appear to any serious extent during this coming season. We are confined therefore to labour supply, as the one doubtful point, and we desire to call the attention of managers in all earnestness at this early period to the subject, to prevent disappointment hereafter. Of course we have no immediate reason for alarm: so far from it, there is now an overplus of labour in the coffee districts. But let each planter calculate how it will be with him during the months of September-December next, and let him make timely arrangements accordingly if possible.

Topics of much importance to planting interests and indeed to the progress of the colony generally, will be noticed in connection with the continuation of a long tour through the coffee districts, by a member of the *Observer* staff, the first part of which is described in the present issue. On such questions as the profitable maintenance of old estates by regular cultivation and liberal manuring; the reserve of forest suitable for coffee in old and new districts; on the advantages of affording further facilities of communication, and the marvellous benefits which have followed to both Europeans and natives from the thoroughfares already opened, no matter in what direction; and on the subject of new products for cultivation such as cinchona (which has already been tried successfully) and on tea which must shortly be systematically entered upon—on these and kindred subjects it would be impossible to pass through the larger number of our planting districts without learning much useful information. One subject of general complaint, we may at once notice,—the dilatoriness of the Executive Government, or more properly we suppose the Surveyor General's Department in exposing to sale further allotments of land suitable for coffee cultivation. There has not been a sale of land now for some time, although we are aware of many applications, and of such capital now lying idle, waiting for such investments. It may possibly be thought good policy to allow some considerable interval elapse, between land sales, now that the available forest land for coffee is becoming restricted. But we can only say that if such an opinion is entertained it is the most foolish, short-sighted policy ever conceived of. It is a view only worthy of the contracted vision of our late Colonial Secretary, Mr. W. C. Gibson, who would not vote for the commencement of the Happootella road, because he feared it would involve the necessity of carrying the work right through from Ratnapoora to Badulla. Does any member of our Executive Government at this time of day, the Surveyor General or any of his Staff, or the Government Agents (in whose hands perhaps the regulation of land sales lies to some extent) estimate the benefit derived by the revenue and permanent population of the country from sales of land, by the bare returns in purchase money?—and therefore conclude that the Government is exhausting one of its resources, which ought to be as sparingly drawn upon as possible. This would indeed be a penny-wise and pound-foolish policy. Notwithstanding all *Speculum's* writings a few years ago, it does not yet seem to have penetrated some official minds that the outlay on land is but an infinitesimal amount of the capital introduced into the island and expended on the soil, on the people of the country, on local and foreign productions (local taxes having their full share) by every proprietor who turns a block of forest into a coffee estate. Taking this year, for instance, with its short crop of from cwts. 800,000 to cwts. 850,000, the outlay in production,—in labour on the estates, in rice (with its handsome import duty), in transport (including tolls), in labour in Colombo, &c., &c.,—cannot be less than from £1,200,000 to a million-and-a-half sterling. A goodly proportion of the earnings of the labour force both on the estates, on the road, and in Colombo, finds its way of course into the Revenue chest, especially through the Customs duty on cotton goods, rice, and other imports. If it were possible therefore, it would be for the advantage of the colony—of the people, Government, and revenue—if every acre of Crown land sure of finding a fair market (with purchasers intending to cultivate and not to hold on for purposes of speculation) could be exposed for sale at once. The delay retards the progress of the colony, and wastes both available capital and energy. We are glad to hear now that the survey of 1,500 acres of forest land at the Bagawantalawa end of Dickoya has been completed, and that the sale of the lots will shortly be announced. We trust this will be followed by further sales at short intervals, until the present brisk demand is fully met, or it is proved incontestably that the limit of available land has been reached. Notwithstanding too, the great work which has been done every day, and every report which reaches us, only serves to strengthen the conviction that great and most profitable additions remain still to be made to the existing facilities for communication between the coffee districts and the coast. These will prove profitable both to the Government and the capitalist. There is not a road in the coffee districts which has not repaid its cost to both over and over again; and it would be entirely beneficial in the end if this colony at once incurred a considerable public debt to raise the capital sufficient not only to construct the Railway to its natural and only satisfactory terminus in the Ouvah Valley, but in connection therewith to open up Maskelliya, Dickoya, Oudepusilava, &c., by branch roads to their further limits, so as to give them the best possible means of communication. Out of this same loan there might well be constructed a branch railway in the direction of Matella, a Dolosbagie road, and the connecting link between the Rakwana and Morowaka roads. If it is the fashion now in certain quarters—and specially in view of the disunion among the Ouvahites,—to talk of Railway extension at all as visionary, of course this grand programme will be perused as a piece of fanciful writing. But at this crisis the colony will have much cause for regret if Mr. Gregory does not take into his consideration a comprehensive scheme for supplying the remaining wants of the planting districts in respect of communication, rather than dealing with separate and detached projects, each involving a large though piecemeal expenditure—a great part of which may be found eventually to be thrown away. There are half-a-dozen projects now on the tapis which must come before the Governor and his Executive before the Legislature meets. There is the Oodapusilava Grant-in-aid

road, 17 miles long, to Newera Ellia, and to cost not less than Rs. [illegible] now almost unanimously petitioned for by the proprietors in that district. Another Grant-in-aid road is proposed to run through the Kettagalla Valley connecting Dimboola and Dickoya. The Dickoya road proper calls for immediate extension, and the Dimboola line will have to go on; while the Maskelliya road already traced, and the Rakwana road just about to be traced, call for attention. The general public have little idea, for even merchants and planters themselves do not realise as they ought, what the difference between a district without a road and one favoured with one, much more with a Railway, really means. Let us give one example before closing our remarks. The estate of Dunbar is one of the earliest opened in Dickoya—having been in existence long before a road was thought of. What the waste of money on transport as well as in loss of labour must have been therefore may be judged from the fact, that the actual saving in transport alone during the first year after the opening of the road to the estate, equalled the entire moiety (no inconsiderable sum) chargeable to Dunbar for its construction.

BANKRUPT POSITION OF THE PLANTING INTERESTS IN BRAZIL.

It is not in Ceylon only that men are, as they phrase it, "ruined by coffee." Here is a startling revelation from Brazil, shewing a worse state of things than ever existed or over could exist here. With us the "black sheep," the recklessly extravagant have always been, certainly are now, the exceptions, and coffee well-conducted seems to yield returns immensely more than they reckon on in Brazil. It is a Brazilian who writes as follows in the *Anglo Brazilian Times* and we may take it for granted that he does not speak at random. It is evident that if the Ceylon coffee planters are true to themselves, live moderately, and are industrious and intelligent cultivators of coffee, their chances of success are about the best in the world.

The *Correio do Brazil* says the present situation of agriculture among us is serious. Its means of production have diminished, its expenses have increased, while its liabilities have doubled. From 1853 planting began to be regular and to spread, roads and settlements increased, and greater wants and more advanced habits of life grew up with the development of commerce. Credit gave latitude to those aspirations, for the coffee planter had but to draw to receive unlimited advances against his actual possessions or his anticipated harvests. The facility of credit, added to the dazzling prospect of vast profits and increased dominion, seduced the planter's minds and also, unhappily, gambling and luxury devoured great part of the fund thus obtained. Their debt increased enormously, and finally, planters, once rich, almost feudal owners of vast domains, awoke one day almost in penury, through the devouring action of interest, for, while the most productive plantations did not yield nett more than 8 per cent. a year: the usual interest paid by planters of the highest standing was 12 per cent. In 1861 the planters owed over 200,000,000$, that is, more than the value of two years' crops of coffee in all the empire, at the same time the most accessible lands had been exhausted, that labourers had become decreased in numbers, and that the soil required greater labour and more methodical cultivation. The consequence was the rapid decline of the business, houses having relations with the planters, and the transference of their mortgages to the banks. The numbers of establishments diminished in many municipalities, the extent of their cultivation lessened, and the less fertile lands were abandoned once more to nature. The transition must have caused much suffering and must have obliged all the industrial classes to begin a more practical and thoughtful life. But nothing has as yet been done to draw agriculture from its false position. Banks of loan to agriculture have all been condemned on theory, and no hope is cherished that planting can re-enter upon a progressive life without first passing through a painful and fatal dissolution. Perhaps, however, this absolute judgment is erroneous, perhaps planting may still find resources in itself to fertilise its future and render the present power of production unfailing and progressive. Some means to this end the *Correio do Brazil* will point out.

Journal do Commercio says that though no country surpasses Brazil in natural advantages, its agriculture is not prosperous, and it is menaced with complete ruin unless a reform in the conditions of farm labour be effected, the system of destructive cultivation be abandoned, and agriculture be carried on in accordance with the dictates of agricultural science. Ignorance of the commonest elementary principles of agriculture is, as a rule, the characteristic of the farmers, and complicated with the already serious difficulties of the labour question, that ignorance, if not removed, will, at no very distant time, bring about their complete ruin. To prevent this ruin professional instruction is wanted to promote a better system, improved implements to stir the soil, labour-saving machines to multiply the effective powers of the labourers, and manures to maintain or restore fertility. The *Correio do Brazil* believes that, though the political horizon looks calm now, the country is threatened with a serious, social, and financial crisis, sooner or later, through the difficulties of the agricultural interest. Before long, the substitution of the slaves will be the principal condition of its life, and, looking to antecedents, it cannot be doubted that their substitution will be realized too late, and on too small a scale, the probable consequences whereof are well-known.

The *Correio do Brazil* says that the situation of commerce in Rio has been very serious for many years. Subjected to progressive taxation, to heavy duties, to the financial whims of the statesmen, who follow one another in power, it can never count on to-morrow, it can never enter the path of stability with assurance, and its situation calls for profound consideration.—*Ceylon Observer.*

RELATIVE BURDENS OF TEA AND COFFEE.

(*From the Ceylon Observer.*)

In a paper by Mr. Dudley Baxter, respecting the pressure of taxation on families in Britain, spending in the year 40*l.*, 55*l.*, and 500*l.*, respectively, the writer states:—

"In calculating the duty paid, I have considered it indispensable to make an allowance for the interest and profit which dealers will receive upon the amount of the tax. Great stress has been laid upon this element of the question in many writings, and I have endeavoured to be on the safe side by taking it at 20 per cent.

"I have considered that licenses required for the sale of tea, coffee, beer, wine, &c., are always paid for ultimately by the consumers of the articles, and I have calculated the effect by adding the license duty to the customs or excise duty which would have been equivalent to the license duty. The rates of duty thus arrived at are as follows:—

"*Tea*—6*d.* per lb. Effect of licenses, ·15*d.* per lb. Total 6·15*d.*, with profit 7·4*d.* per lb.

"*Coffee*—4*d.* per lb. License included in tea, with profits 4·8*d.* per lb."

It would seem from this that, allowing proportion of license, each pound of coffee is raised about 5*d.* per lb. in price to the consumer by the effect of duties, licenses, and profit, as against about 7*d.* in the case of tea. The duty on coffee is 3*d.* per lb, as against 6*d.* on tea, so that at first sight it would appear as if tea at an average value of 2*s.* per lb. paying 6*d.* per lb. duty, and coffee at an average of 1*s.* per lb., were each fairly rated so long as a tax of 25 per cent. on their value is considered necessary for revenue. The lb. of tea is, however, ready at once for use: it is dried and fired. The coffee is only sun-dried, and cannot be used until it is roasted to a brown charcoal. In this process an immense proportion of the weight is lost, so great a proportion that those interested in the coffee trade insist on it that the article is unfairly weighted with duty as compared with tea. Mr. Gladstone denied this, but authorities who ought to know, still hold to the position we have indicated. We suppose the question will come before Parliament during this session. Meantime our readers will be interested in the figures which Mr. Dudley Baxter gives shewing the relative quantities of tea and coffee consumed by families in Britain. He takes a family equal to 3½ adults with an income of £40 a year as consuming 5¾ lb. of tea but *no coffee*, and we suppose the very poor seldom do drink coffee. A family equal to 3½ adults with an income of £85 a year are taken as consuming annually 11½ lbs. of tea and the same quantity of coffee. We should think this a very doubtful estimate seeing that the whole population of Britain consume 4 lbs. of tea annually for each lb. of coffee. Coming up to the middle classes a family equal to 6½ adults with an income of £500 a year are supposed to consume 52lbs. of tea against 20lbs. of coffee. We should think the proportion here again is too high, perhaps, by the odd 6lbs. for coffee. Consumption of coffee in Britain has been increasing, but we suspect high prices will counteract this tendency.

YOUNG COFFEE: TRAVANCORE.

To one of the oldest Travancore planters we are indebted for the following interesting information:—

Travancore as a country is so renowned for its antiquity that no one would presume to call it young: but as a coffee-growing country it is about the last born on earth,—with a trifling exception,—not having attained to a septenary age. Its growth, however, has been somewhat rapid, so that on account of its present dimensions, it may even aspire to a place of notice in the pages of such a grandee in all matters connected with coffee as the venerable *Ceylon Observer.*

There is a special reason why it will be of great advantage that a reliable account of the coffee enterprise in Travancore should appear, with the valuable support of the newspaper, because some time ago an article was published on this subject characterized more by an aspiration for poetical fame than by a regard for truthfulness; and being a rhapsody of exaggerations, instead of a sober statement of facts, those who are acquainted with the real state of things referred to in that article may just laugh at it: but the planters in Travancore, while they neither need not desire the aid of puffing, cannot afford to have their state and prospects misrepresented in pseudo-poetical effusions. And those at a distance from Travancore, or not well-acquainted with the coffee enterprize in the

country, may have received some incorrect and injurious impressions from the high-flown expressions in the article in question.*

The coffee fields in Travancore, as at present existing, may be divided into the northern, middle, and southern districts. The northern district includes the estates at, and about, Pearmade. The middle, those near and to the north of the Augusteer Peak, and in the neighbourhood of Courtallum. The southern, called also the Assamboo Range, includes those between Assamboo in the south, and the Koday River in the north. The following statistics of this last district will be found to be generally correct; but if any slight errors have unintentionally crept in, a correction of them by those better-informed, will be received with thankfulness.

To begin according to seniority of age, the late General Cullen, Resident of Travancore and Cochin, had a garden made in Assamboo proper, in which he planted orange trees, cloves, tea, and many fancy shrubs, and about four acres of coffee. This small patch of coffee is in a flat hollow of the mountain, and has borne a ton an acre in a year, but is quite an exceptional piece of land. This coffee must be now some twenty years old. General Cullen obtained from the Travancore Sircar a free grant of about 800 acres of land on the spot, most of which is useless rock and grass. At the sale of his property by public auction, after his death, His Highness the first Prince, and Sir T. Madava Row, bought the Assamboo land; and then planted all that was available with coffee. To this, the South Assamboo estate, they afterwards added the North, of the same name. Thus from 1863 the start of the coffee enterprize in this district may be dated, though a small estate in the same locality had been opened by a native about three years before. The following is a list of the estates now existing for the most part in the order of age or situation:—

Names of Estates.	Total acres.	Acres planted.	
		or now felled.	
South Assamboo	46	46	Besides an estate on the eastern side of the Pachaiadie belonging to a Native gentleman of Punnakadie of perhaps 200 acres.
North Assamboo	140	118	
Victoria and South Victoria	62	62	
Jooga	25	25	
Sameoone	31	31	
Two pieces near Sameoone	16	16	
Blackrock	190	190	
Oliver's	112	65	
Klamylles	280	230	
Glenmoriston	100	80	
Mahendragherry	700	460	
Woodlands	270	220	
Rora	560	300	
Little Valley	120	120	
Retreat	400	100	
Glenmore	400	280	
Corimony	650	230	
Pommanpattah	140	40	
Seafield	650	300	
Home	400	220	
Great Valley	330	300	
Balamore	340	160	
Milonie	800	250	
Hillside	400	120	
Glenlee	120	110	
Grangevale	120	100	
Glengarnock	300	280	
Eglington	280	140	
Kilburne	350	150	
Eldridge	200	100	
Clachnacluddin	500	150	
Two native estates	90	90	
Total ..	9,382	5,105	

Without extending the present article to include the other coffee districts, the statistics here given bring into notice the fact that, though the fine forests of Travancore for so long a time lay untouched by the planter's axe, they have within a very few years been rapidly opened for coffee to a large extent; and this, with few exceptions, by planters from Ceylon. The question, therefore, at once arises, what were the inducements to embark so much capital in coffee planting in Travancore? In order to do justice to all parties, and especially to the planters, this question must first be answered negatively. Whatever inducements existed, the Travancore Sircar is not to be thanked for any of them. Its conduct towards the planters is not liberal, it is not even just, it is severe and exacting. In former times it made free grants of land, as in General Cullen's case, and at the commencement of the coffee enterprize some few free grants were obtained. When the Sircar saw that land was in request, it made new rules to sell that which was applied for by public auction, at one rupee per acre upset price. No planter could complain of this. But then the Sircar exacts 12 annas per acre per annum land-tax,—remitting this tax for the first five years, provided that one-quarter of the land be planted within three years. Then to crown the whole the Sircar screws out of the planter five per cent. export duty on his coffee. All this together may be denounced, without fear of contradiction, to be *intolerable*. The Travancore Sircar is more severe in its exactions from the coffee planter than any other Government, British, or Native. Contrast it in this respect with the liberal policy of the Ceylon Government, and the Travancore Sircar stands acquitted of encouraging the introduction of capital into its territory; and condemned of exerting itself to deter planters from settling here. The *Ceylon Observer*, October 4th, 1869, had a strong article on this subject in which he himself standing at a safe distance, admired the *courage* of those who embarked their capital under these conditions, and every planter now in Travancore justly cries out against the harsh exactions of the Sircar, and if it were not for facilities as to labour, and some local advantages arising to him in other ways, he would see the Travancore Sircar, with all its boasted enlightenments, at a fearfully distant place, before he would expose himself to its grinding exactions. True it has helped to making roads, but if that is all the Sircar is capable of doing, it will be long before it is looked upon with any good feeling by the planters of Travancore.—*Ceylon Observer.*

* An article contributed to the *Madras Athenæum* is, we believe, referred to.—Ed. C. G.

COFFEE-PLANTIG IN TRAVANCORE.

THE *Ceylon Observer's* speciality of course is coffee. The elder editor of that Journal probably knows more about Ceylon coffee than any other living man. But whilst we are fully willing to allow that our information is not perfect with reference to the plantations and planters of the isle of the spicy breezes, yet we do know something of the sister plantations in the south of our Presidency. We ought perhaps to say *daughter* plantations, for the numerous and rapidly increasing colony of planters in the Assamboo hills, is chiefly composed of gentlemen who have migrated from Ceylon. We must say that we cannot endorse every word of what has been said in a late issue of the *Ceylon Observer* upon the subject of "*Young Coffee—Travancore.*" We know, as an absolute fact, that these young Travancore plantations are extremely flourishing, and have proved in the majority of instances, astonishingly safe investments. Perhaps our present eulogy of them may be termed in the language of the practical *Observer* "a pseudo-poetical puff," and we quite understand wherefore it would naturally be so called. It is easy for anyone who chooses to make thoroughly painstaking enquiries to get behind the scenes by personally visiting those glorious hills of Southern India, ostensibly for a little wild sport, but in reality to spy out the treasures of the land. Why is it that we hear so little of the Assamboo coffee plantations? Why is it that the wonderful discovery of that cool mountain plateau *Muthu Koli Vagai*, suitable most probably, not only for the growth of tea and cinchona, but also for forming one of the finest Sanitariums in India, has been hushed up, and no reference made of late to it? We will take our readers with us behind the scenes, and will do so with no real injury to the interest of the Assamboo coffee-planters, as the latter portion of this article will prove.

The fertility of the Assamboo new plantations have been for a long time well known to us. About two years ago, we published a description of the estates. Scores of letters, we hear, came pouring in upon the chief Assamboo coffee-planters, from gentlemen who either wanted to invest a few thousands of pounds in coffee land, or desired some of the younger members of their families to obtain situations on the Assamboo hills as superintendent of the plantations there, "with a very *very* small share in the plantation worked upon—say one-sixteenth!" So greedily did our largest Firms and Collectors and Colonels, and even English Members of Parliament (one of whom, he believe, has secured an Assamboo coffee estate) rushed to obtain the plums out of the Travancore pie. Of course this was very disagreeable to the planters. They wished canny gentlemen to be let alone, and have all the good things to themselves. And so, "one of the oldest and most experienced of them" writes to the *Ceylon Observer*, complaining that the Assamboo plantations have been praised!

Now this is not a wise thing to do. It should be candidly acknowledged that the Assamboo hill plantations *have* proved an indubitable and splendid success, marred by one great drawback. This drawback is a curious one, and refers to the mischievous policy of the Travancore Sircar, *who are trying their very best to ruin the planters, and what is more, have nearly succeeded in some cases.* We endorse every syllable of the following extract from the *Ceylon Observer*, shewing how the planters of the Assamboo hills, after being signally favoured by nature, and after most praiseworthy and long-extended exertions on their own parts, and after importing a great amount of capital into the Travancore State, find themselves suddenly face to face with an intolerable hardship, an inexcusable injustice, a ruinous tax. It has been said that the Dewan of Travancore, is the owner of a Travancore coffee estate himself, and thus would not burden his own estate by a heavy and unjust tax;—but those who bring forward this argument, forget entirely one remarkable, albeit rather ludicrous fact, viz., that the worst failure in the way of plantations on the Assamboo hills is presented by Sir Madhava Row's estate. It yields so little coffee every year, and so very little leaves Travancore, that only such a tax as a thousand per cent. export duty would be appreciable!

The paragraph in the *Ceylon Observer* to which we refer, is as follows:—

"The Travancore Sircar's conduct towards the planters is not liberal, it is not even just, it is severe and exacting. In former times it made

free grants of land as in General Cullen's case, and at the commencement of the coffee enterprise some few free grants were obtained. When the Sircar saw that land was in request, it made new rules to sell that which was applied for by public auction, at one rupee per acre upset price. No planter could complain of this. But then the Sircar exacts 12 annas per acre per annum land-tax,—remitting this tax for the first five years, provided that one-quarter of the land be planted within three years. Then to crown the whole the Sircar screws out of the planter five per cent. export duty on his coffee. All this together may be denounced without fear of contradiction, to be intolerable. The Travancore Sircar is more severe in its exactions from the coffee-planter than any other Government, British or Native. Contrast it in this respect with the liberal policy of the Ceylon Government, and the Travancore Sircar stands acquitted of encouraging the introduction of capital into its territory; and condemned of exerting itself to deter planters from settling here. The *Ceylon Observer*, October 4th, 1866, had a strong article on this subject, in which he himself standing at a safe distance, admired the *courage* of those who embarked their capital under these conditions, and every planter now in Travancore justly cries out against the harsh exactions of the Sircar, and if it were not for facilities as to labour, and some local advantages arising to him in other ways, he would see the Travancore Sircar, with all its boasted enlightenments, at a fearfully distant place, before he would expose himself to its grinding exactions. True it has helped in making roads, but if that is all the Sircar is capable of doing, it will be long before it is looked upon with any good feeling by the planters of Travancore."

Every word of this is true. Now that Mr. Lowe has announced his intention of doing away with the coffee import duty in England, the "model state" should surely imitate this policy, and reduce, or—better—entirely remove, this crushing tax. We hear that because of this export duty and land-tax, many planters are meditating the sale of their estates. If these cruel exactions were done away with, the rush of further capital into the Travancore Hills would prove of immense value to the country. The following, which we obtain from our Ceylon contemporary, is the correct list of Assamboo coffee plantations, all of which have been opened up since 1863:—

Names of Estates.	Total acres.	Acres planted, or now felled	
South Assamboo.	46	46	Besides an estate on the eastern side of the mountain belonging to a native gentleman of Paramkudy of perhaps 300 acres.
North Assamboo	140	115	
Victoria and South Victoria.	62	62	
Jungs	25	25	
Samcome	33	33	
Two pieces near Samcome	16	16	
Blackrock	190	190	
Oliver's.	112	65	
Kinmylies.	280	220	
Glenmoriston	160	60	
Mahendragiurry	7 9	460	
Woodlands.	27	220	
Bom.	560	300	
Little Valley	120	120	
Retreat	40	100	
Glenmore	400	280	
Corimony	650	270	
Poonanpattiah	160	60	
Seafield	650	600	
Home	400	320	
Great Valley	330	290	
Bahamore	570	160	
Mikonie	660	350	
Hillside	400	13	
Glenlee	150	110	
Grangevale	120	108	
Glengarnock	500	260	
Eglinton	200	180	
Kilbourne	350	150	
Eldridge	300	100	
Cleshandeddia	500	150	
Two native estates	90	90	
Total..	9,383	5,105	

It may perhaps be interesting for coffee planters in other parts of India to know that the oldest coffee-garden on the hills, that which belonged to General Cullen—a garden which, as far as we know, is *not* situated upon exceptional soil—has been known to bear *a ton an acre* in past years! The borer is hardly known at all upon the Assamboo Hills: wind is only destructive in certain localities; drought is only known in the very low plantations; and fever is remarkably absent from these hills, which are situated so close to the sea. Whilst these four curses of Indian coffee planting—borer, wind, drought, and fever,—are absent—from these favoured hills, the planters are, however, afflicted by very heavy taxes imposed by a Brahmin in power.—*Madras Times.*

TEA.

BORING GRUB IN ASSAM TEA-CHESTS.

(Land and Water.)

SIR,—The following account of a wood-boring grub which has completely destroyed a large number of tea-chests recently imported from Assam, will, I hope, be of sufficient interest to merit a place in your natural history columns. I received a short time ago a letter from Mr. S. Cousens, Brook's Wharf, Upper Thames Street, to this effect:—"I send you a little box herewith in which you will find specimens of a grub in various stages of development, and also a gaudy fly, which, I believe, is the ultimatum of the grubs. They occur in large numbers in a parcel of Assam loaded tea-chests just arrived, and which are honeycombed very extensively by these grubs, taking into account the comparatively short time the chests are coming over here."

The box referred to contained some fragments of wood so bored through and through, that they much more resembled pieces of comb of a wasp-nest than portions of a plank. A piece of "tea lead," used for lining the chests also bored full of holes just as though it had been fired at with a charge of shot, two live white grubs and a very elegant beetle which was also quite lively. I was so very much interested with the contents of this box that I at once obtained permission to examine the tea-chests. Most of those I examined had purposely been left untouched, so that I had an opportunity of seeing the exact state of affairs. So completely had the grubs destroyed the sides, tops, and bottoms of many of the chests filled with tea, that the board actually crumbled under the slightest pressure into fine dust. Breaking away the boards, the lead lining underneath was seen to be likewise bored full of holes by the grubs. One grub I found actually eating its way through the lead. And it was curious and worthy of remark that, extending for some little distance from some of the holes in the lead, little bright lines were distinctly visible. It seems to me that the grub had nibbled along upon the surface of the metal until it had found a place suited for boring, and then worked its way through. What their object could be in making these holes in the lead is not very obvious, for it did not appear that they had eaten the tea. The wood is regularly tunnelled in every direction. Many of the excavations take a straight course, running nearly the entire length of the plank, while others cross and recross them so that there is hardly any wood left undevoured.

Only a few very small holes are here and there discoverable on the external surface of the boards. The borers appear to carefully avoid coming into the light, but on the surfaces next the lead-lining the wood is completely channelled. The tea-chests I saw and examined were so thoroughly destroyed by these borers that a slight kick would have crumbled them up. It is fair to assume that when these chests were filled with tea in Assam the boards were strong and sound, although the germs of the destroyers were hid in them. Now if we take into consideration how short a time it occupies to bring tea from Assam in the fast ships employed in the trade, the amount of damage perpetrated by these enemies during the voyage is perfectly astounding. The tea-chests which are attacked by the grub appear to be made of some softish kind of wood, unknown to me, and they are marked as coming from a place called Cachar. I extract the following from "Chamber's Encyclopædia":—"Cachar or Hairumbo, a British district of farther India, lying to the south of Assam between 24° and 60' N. lat. and 92° and 93° 30' E. long. With an area of 4,000 square miles, it is said to contain only 60,000 inhabitants, being mostly mountainous and chiefly uncultivated. The principal river is the Barak, which, after a singularly tortuous course of 350 miles, enters the Brahmapootra about forty miles above Dacca. The territory produces rice, cotton, sugar, timber, bamboo, iron ore, wax, and ivory, and imports salt, clothes, tobacco, and ghee, or half-liquid butter."

So much for the tea-chests, now for the destroyers. The boring grub is the larva of a beetle and is in colour a creamy white. When not employed in eating or moving about it coils itself up, head and tail together, like a hedgehog. Minute hairs are observable on its skin, and the head is provided with a most powerful gnawing machinery. When fully extended it measures about five-eighths of an inch from head to tail. The head portion of the grub, or the anterior third, is larger round than the other parts of the body. The beetle (*Tillicera chalybæa*, White) is very lovely, colour a bright-metallic green, with a stripe of orange on the hinder part of each elytra, or wing cover; minute spots, arranged in longitudinal rows, also ornament the wing covers; minute hairs are also observable. Seen under a magnifying glass this beetle is almost as gorgeous as the diamond beetle of Brazil. Of its habits or history I know nothing more than I have already related, but as I was enabled to obtain a good lot of grubs from the tea-chests, I shall have an opportunity of watching their progress, and will duly record any new facts I may discover. Judging from the structure of the beetle's mouth, I should say it was itself able to bore readily into wood. I presume the eggs are deposited by the female beetle in the timber after it is felled, or it may be after it has been sawn into planks. The eggs so deposited hatch out after the wood is made into tea chests, and the grubs continue to eat and grow during the voyage. With such meagre information as I at present possess, suggesting any remedy would be at best but presumptuous, but I should be disposed to try well-baking the planks before they are made into chests. The high temperature would most likely destroy any eggs or larvæ that might lie concealed in the timber.—JOHN KEAST LORD.

TEA-PLANTING ON THE NEILGHERRIES, PAST AND PRESENT.

It is not our purpose in these articles to ascribe to tea-planting merits which it does not possess, or to give it undue preference over other similar enterprizes, but merely to point out, as clearly as possible, that it can be cultivated with profit on these Hills, and that men of moderate capital and experience may embark in it without fear of the result. Coffee-planting has already been proved a success, and we think it is merely a matter of time for tea to do equally well. The two interests are never likely to clash, or do injury the one to the other. The lands which are best adapted for tea cultivation are those which are just too high for successful coffee culture; and beyond all doubt great benefit will arise to the Hills when these lands are redeemed from idleness, and turned to a useful account. Many of the Hill districts of Bengal are by no means so well adapted for tea-cultivation as the Neilgherries. In Kangra, for instance, the climate is much colder and the winter protracted and severe. There, too, the distance from a market is much greater, and means of transport more costly. In spite of these disadvantages, there are gardens in Kangra which yield their 300 lbs. an acre per annum, thereby shewing how much may be done by high cultivation, combined with a due knowledge of the wants and requirements of the plant.

The soils of the Neilgherries will be found to compare very favourably with the majority of those of other Hill districts, and are, as a rule, less variable in quality. There can be little doubt that at no very distant period these Hills were much more heavily wooded than they are now, and that with the exception of a few of the more elevated plateaux, the soil contains a very fair proportion of organic matter. Since the advent of the Badaghas, large tracts of land have in parts of the district been put under cultivation by them; and owing to their primitive and wasteful system of agriculture, the surface soil has been almost entirely washed away. Until quite recently, they could take up as much land as they wished, without any opposition on the part of the Government, consequently, instead of trying in any way to economize their soil, and to keep the land in a state capable of producing their light crops year by year, they merely took out of the land as many crops as they could induce it to bear in succession, and when they had exhausted that, took up another block, on which to repeat the process. The result is that large tracts of country have been rendered useless by this careless treatment. The only apparent remedy seems to be the gradual, but persistent reclamation of these lands by the planting of Australian forest trees which will, by the annual fall of the leaf, restore to the surface the vegetable matter of which it has been deprived, and in course of time render it again fit to grow either tea, cinchona, or any other crop.

Even good lands, which have borne tea successfully for many years, must in time wear out, so that it is the interest of planters to do what they can to redeem portions of the land adjoining their properties, so that when this time comes, they may still find themselves in possession of land adapted to tea-cultivation.

In all Hill countries, the alluvial vallies which lie between the hills, and the lower slopes of the hills themselves, will be found much richer, both in organic and unorganic matter, than the higher slopes and more elevated plateaux, owing to the constant washing away, from the latter year by year, of the upper surface of the soil, which is carried down and deposited in these lower slopes and vallies. Lands of this description are generally well-adapted to tea cultivation.

One cannot fail to observe that when a piece of land has been cleared and burnt, an entirely new class of vegetation springs up over its surface. Germs of plants which previously lay inactive in the soil, now spring up under the combined action of light and heat, and it is only after a number of years, that the vegetation will gradually revert to its former type. It is not however within our province in these articles to deal with physical changes in the nature of the vegetation of the country, except in so far as they bear directly upon tea cultivation.

The first and the greatest mistake which was made in the experimental cultivation of tea on these Hills, was in the sites and soils selected. A good deal was done in the way of small gardens, both in and around Ootacamund, where the elevation is some 2,000 feet, too high for one to get the best results; and the soil from its weak, dry, and peaty nature, by no means adapted to the cultivation of the tea plant. There was an impression prevalent among many that the tea plant would thrive in any soil, however poor it might be, and that a cold climate was not only beneficial, but absolutely necessary, for the out-turn of good tea. These ideas evidently arose from the fact that in China the peasants near the coast only grow tea on their worst soils. But then China is a thickly-populated country, where the peasant has seriously to consider how he can turn his little plot of ground to the best account for the support of himself and his family, and when he does grow a little tea for the supply of his household, he must do so either in the form of a hedge round his property, or on some small piece of land which will not raise a more valuable crop.

According to Mr. Fortune, the only parts of China in which tea-cultivation is carried out to any large extent, are the hills in the interior of the country, where the soils are of excellent quality; but from the inequality of the surface, by no means well-adapted for agricultural purposes.

With regard to the idea that cold is beneficial to the plant, experience in India has taught us the contrary, inasmuch as gardens in low, warm, and moist situations, give a much greater out-turn per acre than can be obtained under similar circumstances from a hill district. The result of past experience gained on the Neilgherries, is that the best elevation at which to grow tea here is from 8,000 up to 5,500 feet, but in naturally favoured localities, another 500 feet of elevation will not make much difference.

It is not only important to get a good warm equable climate in which to commence operations, but also to make sure that the site you have selected is well off as regards rain-fall, and sheltered from high winds. The latter, be they hot or cold, are most injurious to the growth of the plant, and one has only to look at the miserable appearance and stunted growth of some of the tea grown in exposed places on these hills, to realize the truth of this statement.

There is another impression among many that the higher you grow your tea the better, on the score of the tea manufactured possessing a more delicate flavour. This is true to some extent, but then to get this delicate flavour you must content yourself with about one-third of the out-turn obtainable from a better elevation, and sacrifice the important element of strength. At present the demand in the Home market is not for fine flavoured teas, but, on the contrary, for good fine teas, which, in addition to fair flavour, are possessed of the greatest possible amount of strength. It is for this reason that the Assam teas fetch such high prices in the London market, and our object here, if we wish tea to pay, is to make our out-turn as similar as possible to that of Assam and Cachar. More however remains to be said on the subject, when we come to consider the class of tea best-adapted for cultivation on these hills, at their various elevations.—*South of India Observer.*

MARKET REPORT.

LONDON, 11TH APRIL 1872.

SILK.—(From Messrs. Kilburn, Kershaw, and Co's Circular.)—We have had a generally quiet market throughout the past month, relieved only towards its close by an improved demand for Tussles Cantons, with a considerable business in th s silk chiefly for export, and at slightly improved rates. China silk has remained fairly steady as regards prices; there being very little inquiry and only a limited business for home wants, prices are generally 6d. easier during the month. Japan silk of recent arrival has met with some inquiry, and some fair business has been doing of late in desirable parcels of clean Mybash; other sorts, however, do not find favour with manufacturers. Bengal silk is no better; here and there occasional parcels are forced to sale and at low prices, but unfortunately there is no trade demand, and yet th s silk appears relatively the cheapest offering. Deliveries of all but Bengals were fairly good last month, say, of China, 2,418; Canton, 974; Japan, 763; and Bengal, 285; total, 4,440 bales.

TEA.—A small sale was held to-day; 8,720 packages were advertised, of which 7,427 packages were "without reserve." The sales have passed with fair spirit, and generally at current rates. Several parcels of common to fair Foochow siftings, "with all faults," realized 4d. to 6d. per lb. Siftings and broken-leaf, brought 6½d. to 8d. per lb., and common to fair Congou 1s to 1s. 2d. per lb. A break of infer or common black-leaf Congou sold at 7d per lb. Several parcels of the coloured Japan tea, of old import, realized 1s. 2½d. to 1s. 4½d. per lb., and 750 boxes Foochow, &c.; pekoe, 1s. 5½d. to 1s. 6d. per lb.

COFFEE.—880 casks 70 barrels and 500 bags Plantation Ceylon were offered, and nearly all found buyers at previous prices, the lower kinds being least in request. Triage and ordinary, sold at 68s. to 73s.: small to low middling, 72s. to 75s. 6d.; middling, 76s to 79s. 6d.; good middling to fine bold bright, 80s. to 93s., peaberry, 87s to 95s, 400 bags native Ceylon bought in, good ordinary to fine ordinary, 68s. to 69s.; also 200 bags pale Manilla at 68s, and 70 bags Guatemala at 76s 6d.; 260 packages of Madras sold, triage, 68s, small to middling greenish, 71s. to 74s 6d.; peaberry, 86s. to 88s 6d. 70 packages Mocha, yellowish, 78s, 6d. 30 barrels Jamaica, from fine ordinary to small coloury, 70s 6d. to 73s.; and a fourth part of 950 bags washed Rio, ordinary to middling grey, 70s. to 73s.—*Home News.*

CALCUTTA, 2ND MAY 1872.

INDIGO.—Since our last circular was printed, rain has fallen in *Jessore*, but it was very partial, some factories having had sufficient to finish their sowings, while others had barely enough to lay the dust. The rain did not extend to *Kishnaghur*, where there is still a large area of land unsown, and it is getting very late for present sowings to have much chance of success. From *Moldah*, *Moorshedabad*, *Bhagulpore*, and *Purneah*, complaints of want of rain are very general; the plant holding out well, but, without speedy relief, will sustain injury In *Eastern Bengal*, where manufacture is now commencing, the plant is reported to be stunted and burnt from the long drought, and will, we fear, give but a poor yield. Our advices from *Tirhoot* and *Champaran*, are generally pretty good, although there are some complaints of want of rain, more particularly to the north of the first-named district. In *Chupra*, the plant is looking healthy, and so far promises well There is no change to report in the *Benares-Provinces*, nor can we look for any advices of interest either from that quarter or the *Doab*, until after the setting in of the rainy season.

RAW SILK.—During the week elapsed since our last issue, there has been a very good demand for this article, leading to the following transactions: 10 bales G. G. McP. Rangamatty, at Rs. 23, and about 70 bales ditto at Rs. 23-12; 60 bales I. L. & C. Gonaipa, at Rs 23-12, and about 40 bales G. G. McP. Oragon, at Rs. 21-8 mostly to arrive, being, the whole of the produce of those Filatures during the March Bund; about 40 bales J. W. M. Jungypore, March Bund, at Rs. 21 8; 8 bales C. G. D. B. Ourungabad Filature, coarse size, at Rs. 18-4; 12 bales J. W. Coodumbazar, March Bund, at Rs. 18-8; and about 250 maunds D. K. Commercolly, November Bund, at from Rs. 15-14 to Rs. 16-4 per factory seer.

TEA.—There has been a further small transaction in "New," viz., 40 chests of the Singell Tea Co.'s (Kurseong), at annas 14½ per lb. all round; and in "Old Season's," we have to report the sale of 50 chests of Kumaon growth, produce of the Bynath Tea Estate, at annas 10½ per lb. The weather reports for the past two or three days, have been rather more favourable, but more rain is still needed both in Cachar and Darjeeling.

JUTE.—This staple has been in better request during the past week, and a fair amount of business has been transacted in all descriptions. Really good and fine Jute is scarce and in strong demand, and holders are very firm. Rain is much wanted in the growing districts.

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India,

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

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COW AND OX.

To the Editor of the
Agricultural Gazette of India

SIR,—In Great Britain, horse and cattle breeding is a recognised profession. The stock breeder knowing that his money will always secure him the very best of oats, beans, hay and pasture, has no anxiety on the subject of their production. He knows from experience that if properly fed and cared for, first class stock will produce first class progeny with almost unvarying certainty. If blood and speed is required in the horse (as yet non-existent) he knows how to set about it. If bone and great strength without speed be wanted, he proceeds according to rule to secure it. If speed with much strength and endurance be desired, his experience and practical knowledge teaches him exactly what to do. He leaves nothing to chance and providence, but sets to work with the full knowledge and conviction that certain results can only be attained by following out certain undeviating lines of conduct or procedure.

The wonderful cattle exhibitions of last year, and the supremacy of the English thorough bred horse on the turf, and the hunter in the field, bear about that the art of stock breeding in England has reached a degree of proficiency which as yet no other nation has attained.

In India, however, the very reverse is the case. private gentlemen of fortune, or official means, breed horses, cows, sheep, and pigs, for their pleasure and amusement. The horse, as the most noble animal, being especially favoured, and the others take their chance according to the hobby of the owner being at high or low ebb.

After the gentlemen amateur, the Government is the great horse breeder of India. The studs of India are extensive and magnificent. All that money can supply is forthcoming with the all-important exceptions of professional knowledge and experience, and grass, hay, and corn of first class quality.

It is no fault of theirs that the young military officers of Cavalry and Infantry, whose family interest has got them appointments in the Stud, and kept them there, till they have developed into full blown Majors and Lieutenant-Colonels, know nothing of horse breeding professionally. Nor yet can they or the Stud Veterinary Surgeons be censured for not knowing all about the solution of that intricate physiological riddle, the connection existing between the soil, the plant, and the animal.

Gazetted to a department, whose rules are as absurd and unalterable as the laws of the ancient Medes and Persians, the most intelligent subordinate Stud Officer, dared not propose, much less introduce, anything at variance with old and established usage.

Fact.—There were the stallions, good, bad, and indifferent; there the mares of all qualities save the best; there the zemindars, or Hindoo owners of the mares, when not Stud property; there the stables in which yearlings, colts, fillies and remounts were kept; there the Bazaar which supplied the *Chick peas* (gram) and barley; yonder the common or enclosed land, which produced the grass and hay; there in the distance, the Government Treasury from whence the *cash* came and there the Pay Abstract to be signed and the emoluments drawn monthly, so long as a respectful silence was observed, and all new fangled ideas on the subject of improving bone, muscle, cartilage speed, and strength, no matter how successful elsewhere, and how desirable for study and adoption, were studiously left alone.

The prevailing idea in India, which has been handed down from one generation of stallion keepers to another was that "So long as the sire was sound and superior to his kind, and the country bred dam, or zemindaree mare, was neither razor built, cat-hammed, or deformed, the stallion and *Dame Nature* between them would do all that was necessary, and a first class colt or filly, would in due time be the inevitable result."

The important part played by the dam during the entire period and process of gestation was a cut above the comprehension capacity and philosophy of any zemindar, and consequently the question of placing either the mare in foal, or the yearling and growing colt or filly on suitable diet was never even thought of. Ignorance reigned supreme and being supported by the wisdom of zemindar ancestors the advent of successive generations of worthless progeny was considered as nothing extraordinary. The phenomenon was very easily explained: "The colt or filly had taken after the dam or grand dam, instead of the sire that was all and there would be better luck next time." But year after year has passed away and in place of improvement, the degeneration proceeds with a vitality which is astonishing only to those whose increase of abdominal circumference has far out stripped all other growth, and most especially that of knowledge.

This essay is written for the use of the private stock breeder, and not for the purpose of reforming the system prevalent in the Indian studs for without it there would be no constant and periodical sales of undersized and otherwise condemned stud cattle. In fact, it would be a serious loss to the public to be deprived by change or improvement of the gratuitous services of a great State institution which breeds horses for them at the highest possible cost and then generously sells them for what they will fetch by peremptory auction.

The private breeder cannot afford to throw away his money and will like a rational being, so conduct his operations, as to render success the rule and failure the rare exception.

A reference to any standard work on the horse, will show that unless the dam possesses certain qualifications she will never answer expectation as a brood mare. The Indian zemindar knows little of these qualifications and cares less, with him a mare, is a mare and her expected produce something which may realize Rs 100 or £10, when it is a year old. It may pay a zemindar who owns a country bred mare, to sell his colt for this sum, but no European breeder, possessing good brood mares, could possibly do this without accomplishing his own ruin, and as it is as unlikely for him to do so, as for the zemindar to purchase a first class brood mare, no further notice need be taken of the latter as the possible producer of superior stock.

The actual improvement of the horse in India under these conditions, will rest with the English and Persian gentleman, whose example may perhaps be followed by the titled Hindoo and Mahomedan nobility of India.

In order to progress with my subject, I will assume that an English gentleman, warned by the results achieved in the Indian studs has secured first class mares from Kattiawar, Sindh, Beloochistan, Afghanistan, the Cape, and the Persian Gulf. With such brood mares in his stable, the production of superior stock becomes quite feasible, if the laws of nature are obeyed and followed in place of being set at contemptuous defiance.

The sire of the future brood should either be Arabian, Cape, Bokhara, Australian, and English, and the fillies so obtained should be retained as brood mares. When supplied with such materials, almost

any description of horse may be produced. Thus, if speed and endurance with high breeding was required, the Beelosh dam, and Arab sire, would produce the first generation, and this crossed with English blood (Hunter), should yield the desired result. The Kattiawar mare, and Bokhara sire, would give us a very powerful animal with great endurance and moderate speed, and this crossed by the Arabian, should produce a superior horse for carrying weight, and doing his 40 miles a day, (at a hand canter), and so on with the others.

The particular breed or class of horse required being once obtained, the race need never be lost, and may always be kept up by fresh blood. The blood of the sheep and the blood of the horse are totally different, and though the blood of the sheep cannot be exalted, that of the horse can be debased.

The value of the phosphates in the human economy has already been explained, and it has now to be shown that without their aid and constant presence, the produce even of thorough bred stock must degenerate, if the grass, hay, and corn consumed is deficient in the all-important phosphates of soda, potash, lime, magnesia, and iron.

It has been demonstrated by Liebig and Johnston, as also by eminent American and French philosophers, that the full and proper development of bone, muscle, and cartilage in man and beast, depends not on the fattening powers of their food, but on its richness in the food phosphates, and further it has been recently discovered by an eminent London Physician, that the most successful way of curing bone diseases (imperfect formations) in the human subject, was to be attained by the daily use of ivory shavings boiled down to a jelly.

Analysis teaches us that one pound of ivory contains twelve ounces of the phosphate of lime, with a little of its carbonate, cartilage constituting the remainder. The Physician, by exhibiting the ivory as jelly, artificially enriched the blood of his young and growing patients with bone-forming material, which, when deposited where it was needed, speedily removed the disease, by producing a healthy fully formed bone.

The remedy is so simple and at the same time so efficacious, that it should not be lost sight of by the medical profession of India, in fact it might be used with great advantage in all cases of bone fracture.

From this example we learn that the phosphate of lime, as a rule, acts inwardly on the living bone.

The Indian horse (as compared with that of Arabia, Bokhara, England, &c.,) is deficient in bone, because his mother's food and his food, during the period of osseous growth, did not contain the proper quantity of bone forming material.

The full development of the cartilages not taking place, is due to the want of magnesia, whilst the deficiency of muscle and strength, and the presence of fat flabby flesh, indicates the poorness of the food in the highly important phosphate of potash, and the want of endurance and vigour shows that the blood is more or less deficient in iron.

The evils resulting from a stunted supply of salt, have been already explained. The natural consequences of this state of affairs, is that no matter how well-bred the imported stallion or bull may be, the produce does not equal parental stock. Yet the results of agricultural chemistry teach us that all these evils, with their attendant pecuniary losses and disappointments, would speedily and permanently disappear, if the mare in foal, or cow in calf, was supplied with food to which the food phosphates* had been added in their proper proportions.

It is by no means difficult to manufacture these food phosphates from their elements in a simple, practical, and inexpensive manner, without the use of sulphuric acid. But although the formula has been placed in my possession by the discoverer (Lieutenant J. F. Pogson), I abstain from making use of it, until time and circumstances will justify my doing so.

To resume my subject, it is a well-known fact that the age of the fœtus may be calculated according to the progress which ossification has made, and as the osseous cartilage precedes the formation of bone, it is evident that the size or development of the bone will depend of necessity on that of the cartilage, and if this be stunted *in utero*, from want of suitable mineral matters, it follows that degeneration of bone takes place before birth.

The growth of the bones after birth is kept up by the phosphates (*lime* and *magnesia*) present in the milk of the mother, (which also contains the muriate of potash, derived from the salt of her food), and if these abound, the growing animal shows a corresponding development of bone, but if they are only sparingly present, their slight bones and muscles to match, announce the fact.

This proves conclusively that whilst the sire (English, Australian, Cape, or Arabian) has performed his part of the work of procreation, the dam (irrespective of her form and lineage) has not been able to do her duty by her forthcoming offspring, because she has been supplied during the period of gestation with food rich in flesh and fat-forming components, but most detrimentally deficient in all important mineral matters.

The weaned animal requires food rich in the phosphates to ensure its full growth, and if they are wanting, a stunted undersized colt or filly, (*the counterpart of Government Stud produce*), with muscular power to correspond is, and ever must be, the invariable result.

The phosphates of soda and potash may be obtained by the cwt. or quarter, from any London Chemist, at perhaps four times the cost of the "Pogson formula", and with these in store, the rest can be made up without much trouble or expense.

The phosphates being ready for use, the mare in foal should have her food ("*urdawak*," gram, and bran, or bran mash) daily enriched with them, and it would be advisable to give them in the evening, so that she may digest her prepared food in peace and quietness all night long.

It may interest the reader to know that the bran, of first class English wheat, contains five per cent. of mineral matters, and is in addition highly nutritious, nearly fifteen (14·9) per cent. of gluten being present, with 3·6 of fat, 1 of sugar, and 52·0 of starch. Indian bran, however, is greatly inferior to that of Europe, still the little mineral matters it contains is not to be despised, and if the daily *seer* of bran be enriched with the official Indian ounce (450 grains) of the artificially prepared phosphates, the most marked and beneficial results will follow. Bran possesses the property of stimulating the digestion of other food, and it should, as a rule, be given to mares in foal and milk.

The value of these phosphates will not fail to strike the attention of the intelligent stock breeder, when he is told that what is added to the mare's food, and consumed by her, without delay or inconvenience, is not contained in 30 lbs. of the best English or Scotch barley, which is much more than any mare could consume at one feed.

The quantity required for each mare in foal is 300 ounces for the period of gestation, the first five weeks (35 days) not being reckoned, the use of the phosphates commencing on the 36th evening.

The result of this line of treatment may be foretold with perfect safety, for as it has been proved beyond dispute, that degeneration is due to the want of phosphates, so will the production of a vigorous colt, or filly, perfectly developed in form, *bone, muscle, and cartilage*, establish their value and importance.

By the precautions taken with the dam whilst in foal, her colt, or filly, will enter on life under most favourable conditions, and in order to secure a supply of milk, rich in mineral matters, the daily ounce of food phosphates, with half an ounce of the *muriate of potash* added, will have to be given to the dam until her foal is weaned, and when this takes place, the colts soon will have to be enriched daily with ¼ ounce of them, to be increased to half an ounce daily for the second and third years of their growth and age.

By adopting this plan, which is by no means expensive, when we consider that the disbursement is spread over three years and ten months, thorough and well-bred stock will cease to produce degenerate offspring, and as the constitution of the dam will be renovated and set up by the regular use of the phosphates, her qualities as the parent of future stock, will be greatly and permanently improved.

The keep and welfare of the stallion, demands our next attention.

Most horses suffer from intense heat, but the noble Arabian least of all. To keep their blood cool during the hot weather, and to replace wasted matters, ¼ an ounce of phosphate of soda, and ½ oz. each of the *chlorate* and *muriate of potash*, should be given daily to each horse in his bucket of water, and *during the season*, each stallion should be allowed half an ounce daily of *conserve of tamarindus flowers* to keep his liver and other organs in a healthy state; at this time the ounce of the food phosphates should be given daily to each horse.

We would strongly recommend all valuable stallions being sent to a Hill station during the summer and rains. Thus for Bengal and the North-Western Provinces, *Ranee Khet*, in Kumaon, should be selected. In the Punjab, *Abbottabad*, or *Murree*, and in Bombay and Madras, the best of their Hill stations should be selected. The *chlorate of potash* costs one rupee per pound in Calcutta, and the *muriate* less. The "Baranagore" chemical works, belonging to Doctor David Waldie could supply both, as also the crystalized phosphate of soda.

* Food phosphates, according to the analysis of Doctor Weber, given below, it will be seen that these are very abundantly present in the flesh of the horse, whilst that of the ox contains them in different proportions.

In	Horse flesh.	Ox flesh
Free phosphoric acid.	2·62	17·23
Alkaline phosphates.	30·98	43·06
Earthy phosphates,	16·42	26·26

These figures show that weight for weight, the flesh of the horse contains 32·90 per cent. more of the phosphates of soda and potash, than the flesh of the ox. Now if the food of the mare in foal is deficient in both alkaline, and the earthy phosphates, it cannot fail to strike even the dullest "*typical mind*," that the flesh and blood of the Dam will partake of the deficiency, and as a consequence, the fœtus must suffer from the effects.

The Earl of Longford, recently informed his brother Peers, that he once had "a *typical mind*." His lordship alluded to his Indian career, where this peculiar disease, or obfuscation of the brain, makes its appearance on the Patient's admission into a Public Department.

It has been carefully explained that these mineral matters are derived by the plant from the soil, and by the animal from the plant, and by the fœtus from the mother, therefore if the mother is not freely supplied with them, the degeneration of the embryo commences before birth. These remarks are equally applicable to the cow calf.

THE NEILGHERRY ESTATES.

(*By a Correspondent.*)

Although tea may be looked upon as the future staple export from these Hills, there are numbers of fruit and timber trees, the introduction of which from Europe as also other parts of India, would doubtless prove profitable investments. True apples and pears have been cultivated by some few residents, but scarcely a decent specimen is observable: whether from ignorance or inability the poorest description of plants have been reared. Inferior as their fruit is, it is far beyond the means of the majority of visitors, not many people we imagine, would care to pay Rs. 3 per dozen for pears! Such however is the price asked for those that may be called edible. With a railway from the foot of the hill to both seaboards, the Neilgherries should supply both fruit and vegetables of the temperate zones, not only to the two chief cities of India, but

to all inland towns between them. Many a pensioned soldier possessing some knowledge of horticulture might lay the foundation of a comfortable independence for his family by planting an orchard and rearing the better sort of vegetables. Americans find it pays to send us apples all the way from the "States": surely fruits raised on our mountain plateaus would be found equally remunerative. Of shrubs indigenous to other hill ranges, not one seems to have been thought of, and had the Cassia of the Himalaya and the Cossyah hills received one-half the attention that has been bestowed on the very doubtful experiment of cinchona, a most profitable and healthy trade would have been established. I do not mean to cry down cinchona; I think Government were fully justified in importing this valuable medicinal tree and cultivating it at a loss, but as for its cultivation becoming a success commercially, the results of the last few years answer that question I submit in the negative. If people can be found to prefer the pure bark to the sulphate of quinine, some hopes may be entertained for those who have invested largely in this speculation, but it is unreasonable to expect such a retrogression in the latter half of the nineteenth century. Cassia bark on the other hand is an article of trade surely, though moderately profitable and has formed a large item of export from Calcutta for many years past. The true India rubber vine might be extensively propagated in most of the ravines, though this valuable creeper is said to be indigenous to the Malabar forests. From description I have been able to collect, I doubt it being the true *Ficus Elastica*; another matter that might be well worthy of trial among present residents and intending settlers. All over the Neilgherries, flowers flourish in the greatest profusion, hence *floriculture* would, properly conducted, add largely to the income of those undertaking it. The rise that has taken place in bees-wax during the past decade entitles this branch of industry to the highest consideration. It is rumoured that sericulture has failed in the low country, in all probability from endeavouring to acclimatise the delicate China worm. Now were the worms of Eastern Bengal and Assam brought down, there is but little doubt of success if they were located at some 3,000 feet above sea-level, and care taken to supply them with their natural food, the fresh leaves of the castor oil plant. Many other articles might be introduced, but I have merely glanced at those my experience in other parts of India lead me to suppose would prove most successful.

Though these hills possess most of the elements of success in tea planting, there is one difficulty planters who carry on their work at elevations of say 6,000 feet, generally encounter, viz., the want of labourers. Low country coolies can be obtained for all domestic purposes, but field hands, other than from local sources, are difficult to get. Now for such small plantations as have already been formed, the only men who will work are the *Burghers*, who, however, are to be found in sufficient numbers. But in the case of large plantations, it is necessary to get men from the valleys on an agreement similar to those on which coolies for the Eastern Districts of Bengal are sent. With the railway communication Madras enjoys, the importation of labour to the Neilgherries will be trifling, compared to what it costs to supply Assam and Cachar. Care should however be taken that the daily work put down in each man's agreement should be on a fairer scale than that at present in vogue, which appears to have been fixed by the Burghers themselves, and adopted by the planters without the least calculation,—25 pits 2 feet cube being considered a day's work. This may be fair on very stony ground, but it is ridiculously little on average soil. The simple item of pitting an acre for the reception of plants, costs about Rs. 27 at present rates; but considering that local labour is available for forming the gardens, when the plants are ripe for cultivation, it will be understood that great difficulty must be experienced in working with hill men. These people live in villages, and, as a general rule, do not come to work until 9 A. M. Thus three hours or more of the most important part of the day are lost: for in ordinary weather, on a well-conducted plantation, fully one-half of the tea leaf should be rolled up by that time. The Neilgherry planter will do well to avail himself of the latest inventions in rolling machinery. Although we have not, strictly speaking, a rolling machine that *finishes* the leaf, we have several contrivances that effect an enormous saving in preparing leaf for the final twist by hand, such as those of Nelson, Kinmond, Gibbon, and Maylor. In all probability, another season may see planters in possession of the required machinery either by improvements in the existing rollers, or by some discovery which will be capable of more closely imitating human manipulation than is done now. Perhaps the Americans, who generally take the lead in supplying *labor savers*, may enter the field with something that will rival the famous gossepicker. The high price of labour on the Californian tea estates, will compel our ingenious cousins to turn their attention speedily to the matter. Great results might be obtained if the subject were ventilated in the American papers, and descriptions, or still better, models of Indian tea rollers exhibited. There might possibly be some infringement of "patent rights," but considering the importance of the interests at stake, those who may be wronged by such infringement, might be compensated by a subscription raised among those who might wish to benefit by the improved apparatus.

To return to the Neilgherries, if anything were wanted to show people that the first planters were really amateurs, I would point to the little hovels erected under the name of tea houses. A tea house cannot be too commodious, but this seems to have been quite forgotten by those who first planted tea up here. Matters are however improving. The practice of keeping rolled leaf all night causes considerable loss in strength by evaporation. This might easily be remedied by erecting glass houses exposed to the full influence of the sun, and furnished with pipes for heating in wet or cloudy weather. The temperature to be maintained must depend on the planter's experience. Rolled tea placed in a heap six inches thick, and covered with a blanket, will colour rapidly in a forcing house heated to 100°. The heap will require constant turning to prevent *fermentation*, which means sour tea; and there has been rather too much of that commodity turned out by Neilgherry plantations. With a rolling machine, a forcing house, and other means at hand, all operations of the day should be completed by 5 P. M. even in the monsoon.

BURNING MANURE.

THE *Indian Statesman* says:—"It is the scarcity of manure that is the great difficulty in the way of high farming in India. There being neither wood nor coal for fuel, the people are obliged to burn what we call in England the farmyard manure, and the result is that the land is under chronic exhaustion. In the North West it is the chief occupation of the Indian peasant house-wife, we are told, "after she has drawn the water and kneaded the dough to make the cow-dung into pats, and spread it to dry in the sun. It is then if not wanted for immediate use stacked, and coated with mud to preserve it from wet." Tons of it are every day brought into the large towns for sale, and it forms the only fuel used by the great mass of the population. In the cold weather, when a fire at night and in the early morning is a want, every available bit of horse's sheep's or goat's dung is greedily gathered and burnt. The women of the village may be seen scattered over the grazing plains gathering in baskets every scrap of precious ordure that they can find."

There is another side to this question however, and Mr. Elliott the well-known planter of Mysore, paradoxically affirms that the burning of cow-dung instead of entailing any loss upon the country, is the cause of much manure being given to the soil that would otherwise be lost. He tells us that he consulted a well-known chemist, Dr. Dupre, as to whether there would be any loss in burning the dung of lean Indian cattle, if the ashes were but returned to the land, and that Dr. Dupre was of opinion there would be hardly any. He tells us that 1,000 lbs. of the dung of grass-fed cattle in England, contain but 1 lb. of nitrogen, 3 of phosphoric acid, and 4 of lime, and that the cow-dung of India will be greatly poorer. As the ashes from a ryot's house find their way to the fields through the common village dung-heap, he ingeniously argues that the loss in burning is more than compensated by the manure being more carefully collected than it otherwise would be. He says:—

"I have no doubt that farmers who from a distance send their cow-dung for fuel to the large towns are losers by the transaction, but the general interests of the country do not suffer, as the ashes are applied to lands near the town; and we accordingly read in *Buchanan's work, written seventy years ago*, that 'farmers near the town of Seringapatam send bullocks to the town for all the refuse and sweepings, and besides collect numerous leaves to add to the manure heaps.' It is really a sad thing to have to deprive Indian reformers of their cattle-dung laments: but unless some new and hitherto undiscovered qualities can be found in the manure of lean cattle, I am afraid they must be content to believe, for the future, that India loses nothing by manure being used as fuel. The base of the whole of these delusions, I imagine, to lie probably in the fact that the people argue from the dung of stall-fed oxen, instead of from the dung of lean, grass fed cattle."

Mr. Elliott is somewhat eccentrically: there is an amount of truth in all he says, but it is stated in so extreme a form that we are obliged to distrust him in spite of ourselves. Some of the correspondents of the *Agricultural Gazette of India* will perhaps give us their views upon Mr. Elliott's statements.

EDITORIAL NOTES.

THE Indian Rhea grass has a formidable rival in the Ramie plant of the Southern States of the American Union. Each requires a good machine to separate and prepare its fibre, but Ramie, it is alleged, will prove more profitable than sugar, cotton, rice, or tobacco. Naturalists in India, remarks the *Delhi Gazette*, ought to keep their eyes wide open, for there are around us as precious things as Gutta-percha, Rhea, and Ramie, though we are too blind to see them.

THE *Farmer* announces that, in consequence of the rice crop this year being abundant in Japan, the Government has published an exceptional authorization for its exportation. Such permission is generally refused. The export will be in great part to China, where the harvest, it is affirmed, has been scanty, the difference in the price offering a considerable profit. Some portion will be sent to the United States, but the European markets, it is alleged, are not likely to be affected by these contributions.

WE regret to learn, from a report made by Mr. Robertson, that the Sydapet farm suffered a good deal in the cyclone which lately visited Madras. The engine-house and adjoining rooms have been rendered useless, while great damage was done to the trees, several of which were uprooted, and nearly all suffered severely by loss of their branches. The mangoe crop, rented by a native contractor, is entirely lost; and the cashew-nut crop and several hundred plantain-trees in bearing on the farms, have also suffered.

THE *Spectator* points out that Great Britain, with her 25,000,000 of people, has only 30,898,567 acres under cultivation, of which but 9,675,201 acres are under corn, and 12,435,142 under permanent pasture, the remainder being clover, green crops, and fallow. The total number of horses is 2,110,590, cattle 5,317,759, sheep 27,119,590, and pigs 2,409,602. These figures are exclusive of Ireland, and show a decrease on the year of 12,000 horses, 65,000 cattle, and 1,278,000 sheep. The decrease of sheep has been continuous, the falling off since 1868 being 3,502,000, or 12 per cent., which will explain the price of mutton at home.

AN amusing story of the ignorance of "Rural Bengal" as exemplified by the villagers of Beerbhoom, is related by a Madras contemporary. The magistrate of the district was directed to introduce the Rural Police Act, and he tried the experiment by extending it to about a dozen villages. In forming the *punchayets*, he could not, however, find a sufficient number of men who could read and write; and was consequently obliged to appoint several who could not even sign their own names, and these public-spirited guardians, instead of employing the chowkeedars to watch the village, at once employed them to plough their own fields!

THE *Delhi Gazette* quotes the *Farm Journal* on the subject of whitewashing trees:—

"We are at loss to know for what purpose some persons whitewash the bark of fruit and shade trees about their premises with lime, unless it is to make them look nice. It certainly does them more harm than good, as it serves to obstruct the respiratory organs, and in a measure prevents thrifty growth. Should the bark become diseased and rough, or covered with moss, scrape it thoroughly with a hoe or scraper of some suitable description, after which wash thoroughly with a strong solution of soap and water. If this be done properly every season, it will prove a great benefit, by destroying the insects which prey upon the bark, and otherwise promoting a healthy condition thereof, and increasing the vigour and vitality of the tree."

FROM the *Agricultural Returns* issued by the Statistical Department at home, we learn that 40,000 additional acres of potatoes were planted in 1871 as compared with 1870. The cultivation has increased in Great Britain in each year since 1867, over which year the returns for 1871 show an increase of 135,000 acres, or 27 per cent. In Ireland, the land under potatoes was more by 15,000 acres in 1871 than in 1870. The quantity of potatoes grown in Prussia is very large, the produce in 1870 being estimated at 656,000,000 bushels, or 16,400,000 tons, nearly twice the quantity grown in France in 1869, and more than twice the yield of potatoes in the United Kingdom, if estimated at an average of 4 tons or 160 bushels per acre. The potatoe is largely used in Prussia for distillation.

A CORRESPONDENT enquires of the *Spectator* how it is that while the English peasant never saves, the Irish peasant hoards? The facts are not without significance in the present state of matters at home. The correspondent declares the reasons to be as follows:—

"The English peasant receives regular wages all his life, and saves nothing. His wages barely overtake his weekly needs; next week more will come in, why not spend all?

The Irish peasant, clinging to his plot of land, has an altogether irregular income, he has no certainty of wages, but the uncertainties of the potatoe crop and butter market, uncertainties which afford him a margin for saving and a necessity for self-dependence which his English compeer never has."

Further on, he says:—

"What the Irish peasant needs now is knowledge and opportunity of using the capital thence resulting to the further productiveness of his land, instead of hoarding to no effect. What the English peasant needs is incentive to begin to save. Circumstances do not favour his finding the incentive where the Irishman found it, in precarious living on small plots of land. Where is he to seek for it? In co-operation."

A BOMBAY Journal notices the Urban Phospho-manure Company, now being formed in London, for working Manning's Patents for the concentration of sewage. It says:—

"Ten tons of solid sewage treated by Manning's process, yield, we are told on an average, one ton of concentrated urban manure, containing all the ammonia and fertilizing qualities of the material, and this product, when mixed with super phosphate, forms urban phospho-manure, which is affirmed to be one of the most fertilising manures ever produced, commanding a ready sale at prices ranging from £8 to £10 per ton. The success of the manure has been thoroughly established by experience both at home and abroad, especially on the *Sugar-cane* plantations in the West Indies. Several houses, we are told, in the West Indies and Ceylon have made extensive trials of the manure, for the cultivation of sugar cane and coffee. Mr. Baron, Superintendent of the Royal Horticultural Society's Gardens at Chiswick, says

"The manure has been tried in the gardens of the Royal Horticultural Society Chiswick, during the past two seasons, with very satisfactory results. Judging by these results, I am justified in stating it to be the best patent manure we have ever used."

Our contemporary enquires whether the patents could not be successfully worked in Bombay, and says that were the sewage of the island but turned to account, the difficulties of Municipal finance would be very materially lightened.

THE Mysore Agri-Horticultural Society describes the Travellers tree, or Ravinala, as having a thick succulent stem like that of the plantain, with leaves arranged like an open fan. It is a handsome plant, and suited for shady sheltered spots. In its native country Madagascar) it grows to a height of 30 feet. This tree contains even during the most arid season, a large quantity of pure water, and supplies the traveller the place of a well. A contributor to the "*Garden*" writes from Madagascar as follows:—"Whenever

I enquired of the natives, they always affirmed that the supply of water from this tree was so abundant and pure that when the men were at work near the trees, they did not take the trouble to go to the stream, but drew off and drank the water from the tree. Having formerly been somewhat sceptical on the point, I determined to examine some of the trees, and during my journey this morning, we stopped near a clump of them. One of my bearers struck a spear 4 or 5 inches deep into the thick firm end of the stock of the leaf, about 6 inches above its junction with the trunk, and on drawing it back, a stream of clear water gushed out, about a quart of which we caught in a pitcher and drank on the spot. It was cool, clear, and perfectly sweet."

A specimen of this tree can be seen at the Lal Bagh, Bangalore, but it will still take some years to arrive at its proper dimensions.

Dr. J. Shortt sends to the *Madras Mail* a short account of the bamboo *seed*, which may prove of interest to the general reader. The bamboo seeds annually, the bloom appearing in January. By the end of March, the seeds get ripened, when the people wait for the first burst of the monsoon to throw them down. This year it rained heavily on the Shevaroys over the 1st and 2nd of April, and the Doctor tells that on the 3rd, groups of natives, men, women, and children, entered the bamboo jungles at the base of the hills with baskets, sieves, and brooms to collect the seed for food. The grain he describes as small, about one line in thickness, a quarter of an inch in length, of a light brownish colour, oblong in shape, pointed at both ends, and while rounded off on one side, on the other flat. The germinal spot is placed at one extremity facing the rounded side, and is indicated by a slight depression at the part. The grain when boiled has the appearance, taste, and flavour of ordinary rice, and makes good food for the poor, who, in some parts of India, eat it raw.

The London *Economist* notices an important feature in connection with the present agricultural strike at home, in the displacement of labour likely to ensure therefrom. The Irish peasant is only too ready to take the place of the English labourer, who is migrating to the manufacturing towns; a circumstance which would otherwise raise the price of labour in the localities they leave. In a communication to the *Times*, which the *Economist* quotes, we read :—

"The places of the Warwickshire labourers who have been induced to migrate or emigrate, are likely to be supplied by the spontaneous influx of Irishmen and labourers from other agricultural districts of England, where the rate of wages is not so good as in Warwickshire. Two bands of Irishmen arrived on Saturday, and are eager to take the places of men who have left. It seems that some farmers have had Irishmen in their employ for years, and they have communicated to their brethren at home the favorable opportunity which now offers for the influx of a number of good labourers to settle in the country. At present farmers are not suffering inconvenience from the alleged scarcity of hands, except in the neighbourhood of Moreton Morrell: but work will be found for these immigrants in order that they may be available during the exigencies of harvest time.

Thus the Irish labourer is likely to benefit in case of any extensive movement among English labourers, while on the other hand his immigration will help to avert the consequences attendant on the present strike.

The *Statesman* furnishes its readers with a resume of the facts of the Khandeish Model Farm, which owes its existence to Mr. Ashburner, the Collector of Khandeish. During his absence in 1868, the Acting Collector selected the site about seven miles from the Kujgaum Station on the G. I. P. Railway, and ten miles from Pachora. Operations were commenced on about 200 acres during the first year, the soil being ordinary black soil commonly known as cotton soil. Some difficulty was experienced in obtaining a site which was finally determined upon from "its proximity to the railway, and capabilities for irrigation from the Jamda Canal." The sanction for operations unfortunately arrived too late to do anything that year, which proved moreover the most unfavourable season known in Khandeish for a long time. About 350 acres of land were acquired, of which 200 have been cultivated. The present superintendent took charge of the Farm in 1869-70, but as no budget allotment had been provided, the funds were not assured for continuing the cultivation. It is to be regretted, says our contemporary, that so little is reported on the subject. The Farm is still in its infancy, and has had a hard time so far. These experiments, if worth conducting at all, should be prosecuted in earnest. The Agricultural Department will rear the Farm, we may hope, to a healthy maturity.

Mr. Mechi sends to the *Times* the following comparison of the Agricultural Statistics of the United Kingdom and America :—

The United Kingdom.		*The United States of America.*	
Population	31,628,910	Population	38,925,210
Total area in English statute acres, exclusive of lakes and rivers	76,105,908	Total area in English statute acres, including rivers and lakes	2,000,000,000
	Acres.		Acres.
Wheat	3,981,934	Wheat	19,167,000
Barley	2,018,895	Barley	1,023,700
Oats	4,532,130	Oats	9,461,041
Maize		Maize	37,100,245
Cotton		Cotton	7,750,000
Sugar-cane		Sugar-cane	95,324
Tobacco		Tobacco	431,101
Beans, peas, vetch, and other crops about	6,500,000	Not enumerated.	
Permanent pasture for hay and grazing	22,025,701		
Grass under rotation	6,236,588		
		Average of meadows and permanent pasture for 1869	18,901,281
Horses	2,015,223	Horses	8,218,800
Cattle	9,946,710	Cattle	25,484,100
Sheep and lambs	31,101,500	Sheep and lambs	40,833,000
Pigs	4,146,616	Pigs	20,731,400

Mr. Mechi states his belief that labour must continue to rise in England so long as dairy produce, meat, and bread remain so much higher in price there than they are elsewhere. "To render our acres more productive, to emancipate them from old pastoral and feudal customs, and to treat them on more commercial principles, not only in the matter of tenure, but also as regards prompt and uncostly transfer by exchange or purchase"—is indispensable, says Mr. Mechi, to the well-being of the country.

The London *Economist*, in noticing the popular belief that no skilled labour is required in agriculture, affirms that farm labourers are not the dolts they are generally believed to be. They are as skilful in their own line as artisans in theirs, but for want of combined action have been unable hitherto to assert their claim to better wages. The present movement, it declares to be 'the awakening' of the class. A correspondent of the *Field*, whom the *Economist* quotes, and who is neither a landlord, a farmer, nor a labourer, but who has lived among and observed all three classes, gives the following forecast of the results of the movement :—"The result will, I think, be somewhat this: we may take it for granted that wages will rise, not much perhaps at first, but as the men gain knowledge, they will rise to a standard we little dream of at present. Farmers without capital will have to retire; landlords cannot farm the land themselves, for they have not the capital. They must see that their tenants have this capital before letting their farms; and when they do let, they must give leases; they must pay their fair share of all permanent improvements; they must not draw the reins too tight regarding game. A farmer may not object to his landlord and friends shooting over his grounds; but he cannot stand a stranger trampling over his turnip fields. Landlords should ever bear in mind that their land is of no value, except for the capital and labour bestowed upon it; that as a rule they have not the capital, nor the skill, the prudence, and the business-habits to work it themselves; and that they are dependent for their incomes on the capital and skill of the farmer."

When does a tea plant come into full bearing? and what will a tea plant, properly developed and trained, yield? "Twelve years ago," says the *Indian Statesman*, "when planters committed all kinds of mistakes with the best possible intentions, all their hopes were directed to the formation of estates that should turn out 300 lbs. of tea per statute acre, as that was the quantity the plant was then thought capable of yielding. Until the crisis of 1866,

300 lbs. was supposed to be the most to be got out of the acre by the majority of Bengal planters. During the troubles of 1866 and following years, the only matter that engaged their attention was to get enough out of the estates to avert bankruptcy, and people hardly dared look into the future. The enterprise emerged at length from its depression, and the subject of yield again attracted attention. Mr. Meekin claimed that by his process of pruning he could make certain of 400 lbs. of rupee tea per acre. So matters remained, till the out-turn of the Darjeeling Terai gardens astonished the public. The extraordinary quantity of tea from the Terai gardens is chiefly due to the soil being rich in vegetable deposit, but some Cachar plantations, of eight and nine years standing, give their 600 lbs. per acre. The indiscriminate hacking of bushes has long since been abandoned for the more prudent use of the knife, with the result of an increased yield. Manure and judicious irrigation, when applied to other vegetation, are attended with almost marvellous results, and the application of manure, combining potash and ammonia, with moderate watering, would certainly largely increase the yield of leaf; the only question is how to obtain it. Potash can be made in any garden, while the sewage of Calcutta or any town deodorised with ashes might be sold at a small cost. Thus it is not improbable that the tea plantations may return not six or seven hundred pounds per acre but 1,500 lbs., at the additional cost of manure and irrigating apparatus. Simply irrigating a tea plantation would give at least another month of leaf-bearing to the plant, without the slightest danger of injuring it."

MISCELLANEOUS NOTES.

A STRIKING illustration of the enormous consumption of tobacco in England, was pointed out at a recent Meeting of the Chamber of Manufactures at Adelaide, by a Dr. Schomburgk, in the fact that England spends only three times as much per day for bread as she does for tobacco, or more than £9,000,000 sterling per annum!

A SHEFFIELD firm (says *Engineering*) is now engaged in making a reaper, which will far outstrip all at present in use. The machine will mow grass 6 feet wide with one horse, which may be worked all day. The best machines at present only cut 4 feet 6 inches with two horses. It will reap a breadth of 10 feet of corn also with one horse, and thrash and winnow corn, grind flour, chop turnips, cut chaff, crush cake, pump water, saw timber, and can draw a load of 5 tons along the streets!

THE *Farmer* tells a story in illustration of the intelligence of the Dorsetshire labourers. Two men, father and son, undertook for thirty shillings to pull down a house, and began work at the keystone of the door-way. The house came down quick enough but on the operatives whom it buried in the ruins. The son was killed and the father hurt. The *Farmer* points the moral of the tale by stating that in the present agitation about agricultural labour, townsmen should not interfere with matters they are ignorant of any more than should poor agricultural boors with stones and mortar.

DR. DIO LEWIS, in *Our Girls*, is surprised that a young woman, ambitious of a clear fine skin, should drink tea, which the doctor says is an enemy to fair complexions. Wine, coffee, and cocoa may be used without tinging the skin; but as soon as tea-drinking becomes a habit, the eye of the discriminating observer detects it in the skin. Tea compromises the complexion, probably by deranging the liver. Weak tea or coffee may be used occasionally in moderate quantities, without noticeable harm: but all young women, who would preserve a soft clear skin and quiet nerves, should avoid all drinks but water. It is an excellent plan to drink one or two glasses of cold water on lying down at night, and on rising in the morning. If you have bad teeth, and can help the food into your stomach without fluid, it will, in the long run, contribute much to your health.

THE *British Trade Journal* notices an ingenious tobacco-cutter, which appears calculated to meet every requirement, and to be far superior to the ordinary cutters, which are little better than a common knife:—"The machine consists of a polished mahogany box through which a screw shaft passes, attached to a toothed wheel, placed outside on the left hand, which revolves by the action of the knife fixed on the square end of the pin at the right-hand side of the box. On either side of the wheel are two brass catches, the small one to act as a governor, while the larger catch regulates the cut of the tobacco, making it finer or coarser as may be required. In connexion with the screw-shaft, inside the box, is placed a brass slide, and between this and the cutting edge is placed the cake. The lid of the box, furnished with a steel spring, is shut down, and, being secured by a small catch, serves to hold the tobacco in its position. The knife is then worked up and down, which propels the brass slide, thereby gradually pushing the cake towards the cutting edge, whence the tobacco falls into a drawer fitted for that purpose, and after being rolled in the hands, we need scarcely say is ready for use."

THE following is a description of a monster Chinese vegetable, *Sooly Qua*, introduced into Bangalore last season:—"This remarkable vegetable from Foo-choo-foo, is wonderful for the immense size of its fruit, its large dark green glossy leaves, and the beauty of its flowers. In China it is used by the natives as a regular article of food, boiled with rice, or cooked in various ways, and is stated to be much enjoyed by Europeans residing there. The fruit is of rapid growth, attaining in this country a length of five to six feet, and a circumference of 12 to 16 inches: it is used in the green state just when attaining its full size. The seed should be sown in May, when the first showers of the S. W. monsoon commence, in pits, like vegetable marrow, and be plentifully supplied with water. The only novelty in its treatment is that the plant must grow up a trellis at least 7 feet from the ground, so that the fruit may hang clear, for if they rot they come in contact with the ground."

WE take the following regarding the Upas tree, or as the Yankee preacher called it the "Utopia tree," from the *Delhi Gazette* which in its turn takes it from the *Journal of Chemistry*:—"Mr. Foersch, a Surgeon in the Dutch East India Company's service in the last century, described the tree as poisoning the air of the whole valley where it grew, so that neither animal nor vegetable could live there. But when Deschamps and Leschenault visited Java, they found that the tree flourished only where vegetation was most luxuriant, and was haunted by birds and insects. In another part of Java, there is a narrow valley where neither animal nor vegetable life can exist, owing to the exhalation of carbonic acid gas from an old volcanic crater. Upas, we are told, is a Malay word meaning poison, and is applied to a variety of vegetable products. The proper name of the so-called Upas tree is the *antjar* or *antiar* (the *Antiaris toxicaria* of Leschenault) which grows in many parts of the Sunda and Philippine Islands. It is a very beautiful tree, and sometimes grows to the height of a hundred feet. From its milky juice, mixed with black pepper and the juices of certain roots, the Malays prepare a poison for their arrows, which is very active and virulent. Cloth is sometimes made from the bark of the *antjar*, but unless the fibre has been thoroughly cleansed, it produces a painful itching when worn next to the skin.

In Pouchet's *Universe* it is stated that the juice is not poisonous, unless introduced beneath the skin. While Leschenault was examining one of these trees, which he had cut down, the exudation from the broken branches flowed over his face and his hands without injuring him. But eight drops of the juice injected into the veins of a horse, killed it directly; and criminals have been known to die in five or six minutes after being pricked in the breast with a lancet dipped in the juice."

AGRICULTURAL STOCK.

INDIAN CATTLE PLAGUES—MADRAS PRESIDENCY.

We noticed last week, under the heading of "Cattle Poisoning," the Report of the Commission appointed by the Supreme Government to enquire into the origin, nature, &c., of Indian Cattle Plagues. In the same report is embodied a peculiarly interesting history of cattle murrain in the Madras Presidency. The document takes us as far back as 1791 when a severe murrain broke out among the cattle with the Army of Lord Cornwallis at Bangalore and Seringapatam. We next find the disease attacking a large cattle depôt at Hoonsoor. In 1811, there was a very destructive murrain in Mysore, and in order to prevent the spread of the infection, the healthy cattle were parcelled out into small groups, which were distributed over the neighbouring pasture. These measures, it appears, saved large numbers of the Government stock. Colonel John Hill, Commissary General, in reporting on the subject generally, states that "every means should be used to prevent the spread of the disease; *healthy cattle should, if possible, be moved from the neighbourhood of infected localities.*" This proved particularly successful in Mysore, at the time the Amrut Mahal was in existence; and in seasons of sickness, when the casualties among private cattle, which were not moved, were counted by thousands, the Government herds very frequently escaped. The nature of the disease, prevalent in Mysore, will be seen from the following brief description by Captain Harvey, Assistant Commissary General:—"A purulent discharge from the nostrils, eyes, mouth, and ears, excoriating and ulcerating the parts, and a violent diarrhœa." Some persons called it a "violent dysentry." The disease was no doubt rinderpest. While the cattle in the depôt remained comparatively healthy, detachments for Bellary, Chittledroog, Nundidroog and Royacottah, passing through affected places, were severely attacked, and many died. The disease is called *burra azar*, or the great disease. Captain Harvey considers it to be the same as the "malignant epidemic fever which has so frequently ravaged the herds of the continent of Europe." Stimulants, nutrition, local disinfectants, and astringents were the chief means of cure, and a heavy fall of rain appears to have put a stop to the disease.

In July 1863 a very severe murrain appeared in the Kurnool district, and carried off hundreds of cattle. The symptoms usually were refusal of food, ears drooping, eyes watering, purging succeeded by a bloody flux, an eruption of large pustules covering the whole body, and death between the 5th and 10th days. Early in 1864 the Government appointed Surgeon J. Thacker to investigate and report upon this disease,—called by the natives, *pedda moosa roguu*. In his report, Mr. Thacker says he found that without personal support from the civil authorities, he could do little in the way of inducing the people to adopt any rules for treatment or prevention. By prescribing simple bazaar drugs, everywhere procurable, (camphor, nitre, opium, catechu and datura), and a continuous administration of nourishing gruel, he saved 39 out of 44 cases (75 per cent.) treated at Ravypad. In 1864, Mr. W. G. McIvor, Superintendent of the Government Cinchona Plantations, reported that a severe kind of rinderpest was raging on the Neilgherry Hills. In the same month Dr. Shortt reported a sheep disease, of which "swelling under the jaw" was the most prominent early symptom: if the animals recovered from this, purging supervened on the 5th day, and death was the invariable result. Dr. Shortt found no "flukes" in the animals examined; he attributed the disease to diet, and found that the only animals which escaped were fed on grain food.

The next notice of murrain is also from the Neilgherries. The disease had been imported from the plains by cattle sent down to Coimbatore to carry machinery. One of these was attacked eight days after returning to the hills, and thirteen others of the same lot were subsequently seized. Of the first five animals attacked, four died and one recovered. Mr. Thacker's published directions for treatment were then adopted, and of thirteen attacked, four were saved in the early stage by the administration of slight laxatives and gruel; and eight were saved after diarrhœa had set in by giving camphor, datura, nitre, chiretta, and arrack in *ufi* (gruel); only one old, debilitated animal died. Mr. Thacker, in forwarding his report of the attack to the Collector of Coimbatore, states that the native cattle-owners, on the outbreak of this disease, "immediately drove away their cattle many miles distant." Cattle disease (rinderpest) is next reported from Mudumallai and Mussicoil in the Sigur Valley among the cattle belonging to the Forest Department. The disease broke out on the 24th December 1865, and out of 150 bullocks, 31 were attacked, 12 died, and 19 recovered. The treatment was similar to that adopted by Mr. Thacker,—chlorate of potash and gruel being given in the early stages, and opium and gruel in the later.

Mr. Thacker next reported (20th March 1867) on an outbreak of *sukkai* (rinderpest) in the North Arcot district. It was first observed about the 12th December 1866. Mr. Thacker followed the system of picketing healthy cattle out in detachments, and found the villagers willing to adopt this measure. He continued the same method of treatment, and records a most striking fact with regard to the advantage of careful dieting. "I find that the cattle of the six prior villages have died to a larger extent, as of 300 attacked, 250 died and 50 only recovered; whereas in the village of Pallavaram, of 128 attacked, 65 recovered. Such a striking contrast I find to have arisen from the care and attention of the latter village people, having saved them by daily administering quantities of gruel." Mr. Thacker's last report on cattle disease in Madras is dated the 14th November 1870, and details the prevalence of disease in Malabar, Canara, Neilgherries, Cuddapah, Bellary, Kurnool, Madura, Secundrabad, and Salem. The same principles of segregation, parcelling out herds, and treatment we adopted, and in nearly every instance with success. Mr. Thacker writes:—"Segregation has been, whenever adopted, invariably successful in stopping outbreaks of disease. It is a preventive measure of incalculable value to the country. It would save the lives of thousands of cattle, and I exceedingly regret that under present circumstances, it cannot at all times be carried out."

The general inferences to be drawn from experience in Madras are:—

1. That rinderpest, known most commonly by the names *sekkai ammai*, *burra azar*, *doddah rogue*, *kadinoy*, *surakk*, &c., is a well-known and widespread disease in the Presidency, and has prevailed extensively since inquires began to be made into the subject.
2. That foot and mouth disease, swelled throat, black quarter, and cystic disease are also common forms of cattle sickness.
3. That for the prevention and treatment of rinderpest, strict segregation and medical treatment have been found successful.
4. That the separating of the healthy is better than removing the sick.
5. That by carefully conducted segregative methods, the disease may be effectually limited to a certain locality or number of cattle, and its further spread prevented.
6. That by suitable dieting and careful medical treatment, a certain number of animals recover more than if they were left to nature.
7. That any legislative interference is considered strongly unadvisable in the Presidency, after careful and anxious attention has been bestowed upon the subject.
8. That by persuasion, example, and personal influence, the people may be brought to adopt the necessary measures of prevention and treatment.
9. That the plan of protecting cattle by inoculation has not been entertained favourably, and all the thought and action adopted has tended to the opposite aim, namely, repression or stamping out.

We shall touch upon another phase of the subject in a future issue.—*Friend of India.*

FARMING IN AUSTRALIA.

We have from time to time drawn attention to the progress and position of our several Australian colonies, because in their advance we are specially interested, not only for the supply of wool they furnish for our factories, but also as marking the progress of colonization and the introduction of those improved implements and machines and processes of farming operations which have so greatly advanced the interests of the mother country. The receipts of the official returns of the Registrar Generals, relative to the census taken last year, furnish us with some valuable data by which we are able to measure the decennial progress made in the principal Australian colonies, and to some of these more salient points we shall draw attention, in the belief that the figures may be studied with advantage by many.

It is curious to trace the progress of Australia since the first settlement in New South Wales about eighty years ago. For upwards of twenty years the colony made little or no advance, and indeed it was not until 1840 that a new era commenced, which led to rapid strides in pastoral, agricultural, and commercial, together with industrial pursuits, and the gold discovery in 1851 caused an advance more remarkable than could have been anticipated by the most sanguine mind. The production of gold in Australia from its first discovery has exceeded in value two hundred millions sterling. In 1803 Tasmania was settled. South Australia, about half of whose geographical limits were included in the original colony, was founded in 1836. Victoria was separated from New South Wales in 1851, and Queensland in 1859. The limits of New South Wales, after these successive subdivisions, still comprise an area of 207 million acres. The statistics of New South Wales, as it now exists, would give a very inadequate idea of the results achieved within the boundaries of the original colony. It is proper to include in such a statement a statistical estimate of all the colonies embraced within the original limits of the parent settlement, and if we do so, we shall now find an aggregate population approaching two millions of revenue, exceeding seven millions, and an aggregate import and export trade of fifty millions sterling.

At the close of the last century there were in the whole of Australia but 57 horses, 227 cattle, and 1,531 sheep; in 1870 the horses numbered half a million, the horned cattle four millions, and the sheep forty millions.

We will now take a brief glance at two of the offshoot colonies of New South Wales, South Australia, and Victoria, because it is in these that agricultural pursuits have made the greatest advance. In South Australia, out of 3,712,000 acres of land, more than one-half is in the hands of holders of from 500 to 1,500 acres, and these holdings are in some instances in connexion with freehold sheep-runs. In the strictly agricultural holdings, the tendency of late years is to increase the size of the farms. There is sufficient evidence that the days of 80-acre sections are past, and that the farmers are alive to the necessity of carrying on their operations on a more extensive scale, and are in a position to do so.

Two-thirds of the tilled ground in South Australia is under wheat; out of nearly one million acres upwards of 604,000 being cultivated with this cereal. Three-and-a-quarter acres of wheat were sown to each individual of the population, as compared with less than 2¼ in 1862, when the total area of the wheat crop was 310,638 acres, or little more than half its present extent. The total quantity of wheat reaped in the season ending 1871 was nearly 7,000,000 bushels, the largest harvest ever gathered in South Australia. The average yield of grain, however, was not equal to the promise the luxuriant appearance the crops at first gave, only 11½ bushels to the acre being reaped for the whole colony, or some two bushels less than was anticipated. Wet and boisterous weather during harvest, red rust, and other contributing causes, led to this deficiency. With a large crop in South Australia, Adelaide can ship considerable quantities of wheat and flour. Thus in 1869 the exports were upwards of 1½ million bushels of wheat and 38,000 tons of flour; in 1867, 2½ million bushels of wheat and 43,700 tons of flour. The export to the neighbouring colonies of Victoria, New South Wales, Queensland, and New Zealand, is usually large, but varies according to the harvest in those colonies. The average price of wheat has varied in South Australia, in the past ten years, ranging from 8s. 7d. per bushel (the highest) in 1865 to 4s. 5d. in 1867; but, judging from the last few years, 5s. would seem to be about the mean price.

The highest yield of wheat per acre in South Australia during the past ten years has been 14 bushels 20 lbs.; the lowest in 1868, when it was only 4 bushels 40 lbs. The three harvests immediately preceding the last were exceptionally bad, the average of the three being 6¾ bushels only, and consequently severe depression prevailed among all classes. With an average yield, the last harvest gave 110,000 tons of breadstuffs for export, after providing for the local requirements. Thirty-eight bushels of wheat were grown for each individual of the population, as against 28 bushels per head in 1862. The value of the wheat crop alone cannot be estimated at less than £1,750,000 sterling. The distribution of so large a sum amongst the farming population (small in number) has naturally tended to restore trade, to encourage confidence, and to the rapid extension of agricultural operations.

In 1862 the live stock in the colony consisted of 52,597 horses, 205,434 horned cattle, and 3,038,350 sheep. In 1871 the numbers were 83,744 horses, 136,832 horned cattle, and 4,400,655 sheep. The prices of fat stock, as furnished by Messrs. Dean, Laughton, and Co., stock and station salesmen, were at the close of 1871 as follows:—Fat wethers, first class, 11s. 6d. to 15s., second class ditto 10s. to 11s.; bullocks, first class £8 10s. to £14, second class £5 to £8; cows, first class £6 10s. to £8, second class £4 10s. to £6 5s. As respects sheep there is a considerable advance compared with 1869, but cattle have declined in value about £1 a head.

Passing next to the colony of Victoria we find that the area is estimated at 55,644,000 acres, or just upon 87,000 square miles, nearly as large as Great Britain. The extent of land alienated or sold in the past ten years has been about 3,000,000 acres, which has realised on the average 30s. per acre. The squatting runs number about 1,000, embracing 27,700,000 acres of crown land; and there are 2,376,000 acres of purchased lands attached to these runs. This shows a decrease of the land devoted to squatting in the ten years of nearly 14,000,000 acres. The total area under occupation on the 31st of March last year (1871) was 9,530,000 acres, of which about one-fourth was crown land, rented for tillage, and the rest purchased land. Of about 460,000 acres under grain 884,000 was sown with wheat; the produce being 2,870,000 bushels. The extent of land occupied and cultivated have each more than doubled in the ten years, having been respectively as follows:—

	Acres occupied.	Cultivated.
1862	4,090,784	450,890
1871	9,530,638	909,615

Slowly but surely the agricultural settler is encroaching upon the pastoral tenant of the crown, and the squatter is proceeding further north, where there is still room for the free selection in which he delights.

The land would appear to be chiefly held in small parcels, as the number of holders is 31,842, and one-half of these are under 50 acres. After wheat—oats, hay, and green forage appear to occupy most land.

The wheat crop of 1871 seems to have been far below 1870, which produced 5,697,056 bushels from nearly the same extent of land. The highest yield of wheat, however, was in 1867, when the average produce was 22·3 bushels per acre. The yield of hay seems to average 1½ tons per acre, of potatoes 3½ tons per acre. The number of persons employed on farms is 78,520, of whom 23,124 are females; and the number on stock stations, 7,242—of whom 1,659 are females.

The live stock upon farms and stations in the colony in 1870 (the returns taken under the census for 1871 are not yet complete) were—horses, 167,220; cattle, 721,096; sheep, 10,761,987; pigs, 130,946. The return of sheep represents nearly the whole number in the colony; but the figures for horses, cattle, and pigs are less complete, as it was impossible to form estimates of the numbers kept in towns, or the gold fields, or of the horses and working bullocks used by carriers upon the roads.

The return of the agricultural machines and implements in use on the farms and squatting stations, shows that the colonists are alive to the importance of the employment of the best cultivating and harvesting machinery. We enumerate the chief of these: 329 steam-engines of 2,771 horsepower:—

Chaff-cutters	5,061	Mowing-machines	790
Corn-crushers	148	Ploughs	25,287
Carts and waggons	38,826	Reaping-machines	4,265
Cultivators	52	Rollers	6,456
Harrows	20,459	Thrashing-machines	1,698
Hay-rakes	347	Winnowing do.	2,039
Horse-hoes	286	Wool-presses	740
Horse-works	2,163		

A good many implements, &c., are now made in the colony by 42 factories employing 450 hands, and 1,346 packages valued at £6,807 were exported in 1870; and some are imported from South Australia. Those received in 1870 from the United Kingdom are returned at 772 packages, valued at £14,836.

The approximate value of the agricultural machinery and implements in Victoria is given at £1,512,013, of which £100,000 is on stations in the pastoral districts, and the rest upon farms.

There were 147 mills in the colony for grinding and dressing grain, of which 137 were worked by steam and 10 by water. These had 452 pairs of stones in operation, and employed 690 hands. They made 114,754 tons of flour during the year, and the value of the machinery and plant of the mills is estimated at £245,170. And all this progress in Victoria is the result of only about thirty years' industry, for in 1841 the population was a little over 11,000, where now three-quarters of a million souls are settled.

There is one Australian industry we must not pass over without notice, and that is meat-preserving, for which there has lately been such a rage, although the collapse has commenced. In Victoria alone there were no less than 14 meat-curing establishments, employing 694 hands, in Queensland there were seven, in New Zealand five, and in New South Wales and South Australia two each; in all 30 establishments. From South Australia, 5,000 cwts. were exported in each of the last two years, and from Victoria in 1870 there were shipped 6,500,000 lbs. of preserved meat, 834 cwts. of cured, 1,644 cwts. of salted beef, and about 15,000 lbs. of bacon and hams. As respects the preserved meats we fear that this trade will prove a ruinous loss to the shippers, for the home market is glutted, and it makes little headway, even in the poorhouses and prisons, while the large quantity of spoiled tins of meat recently destroyed has caused such imports to be looked upon more suspiciously than ever.—*Mark Lane Express.*

EXPERIMENTAL CULTIVATION IN INDIA.

THE KHANDEISH MODEL FARMS.

And so Mr. Rivett-Carnac, Berar's old friend, has gone home! It is to be hoped he has taken in his pocket the financial statements of the experimental cotton farms in Berar, for the purpose of laying them before the Finance Committee now sitting in London. The Khandeish farm accounts, as disclosed by Mr. Ashburner, show a very sad state of things indeed, but I believe the Berar farms will beat them hollow. From first to last they have been gross failures financially, and every year goes on adding to their troubles. This year, I am told, has been the worst of all, for while the expenditure can only be reckoned by thousands, the revenues don't make as many hundreds. Last year the excuse was that cotton was low in price; this year cotton was higher, but the weather was unpropitious; and so it will be, I fear, to the end of the chapter. But why is all this, ask people? Why is it that while the simple ryot can cultivate his field and flourish and grow fat upon

his produce, the "model" cultivator under Government auspices and protection, with no land rent to pay, can only go on year by year heaping up a heavy load of debt upon his head? Both last year and this one too, notwithstanding the misfortunes that have befallen the "model" man, the ryot has undoubtedly added to his store. He has lived his usual happy life, he has married his children and been as profuse at the weddings as ever he was, and today he is freer from debt than he has been for many a long year. Then in the midst of all this, why should we find the "model" man sitting steeped to the lips in poverty with, in fact, the bailiff at the door? Mr. Ashburner could give no explanation in London, and I dare say nobody very well can. Mr. Ashburner thought they would pay in time. I fancy when he said so he was taking a long cast into the future, where perhaps he saw the Americans again cutting each other's throats, and Indian cotton two shillings a pound. Were such things to happen, I doubt not model farms might then pay; but I think we have had sufficient experience from the past, to show that, under ordinary circumstances, they will hardly earn the superintendent's pay, and will always remain a heavy burden upon the country. Yes, it is plain enough now to anyone who chooses to read the lesson that European agency, even backed up by Government, cannot compete with the ryot in cultivation. And the reasons are not at all obscure. The ryot, with his wife and children, cultivates his field and sows and reaps it, and if he wants any further help, he gets it from his neighbours, whom he repays in kind. But with the Government "model" man, how different it is! He stands alone in his garden like another Adam at the creation, helpless and forlorn. He really can do nothing for himself, and for all the assistance he requires, he must beg it from without. This consists entirely of the coolie class, a class which certainly don't labour for the love of it, a class in fact whose prime object is to get as much pay as it possibly can, and to do as little as it is possible to do for it. In this way a terrible bill is run up in the course of a year, from which the ordinary ryot is altogether free. Of course there is the European superintendent of the farm who, you will say, ought to look after the coolies and see that they work. But what can the poor man do with the thermometer at 100° in the shade? This is now the ploughing season, and ploughing, it will be admitted, is the most important operation in farming. Upon it, in fact, depends the coming crop. Were it possible, the superintendent ought to be behind the plough all day. But it is simply impossible for him to be even an hour at such a post. The most he can do is to survey from behind a "kuskus tattie" in his bungalow the ploughing going on, perhaps a mile off. In this way, you will see, "model" farming is not the fancy thing it is supposed to be. To retain its place in the imagination, it must only be read about in Mr. Carnac's glowing reports; it will never do to examine it closely with the naked eye, for it is, in truth, only a very inferior sort of cultivation, at the best, inferior by far to the cultivation of the poorest ryot. The ryot is interested in his field and knows he depends upon it for his bread, and does his best for it. The coolie who really cultivates the "model" farm, and who in a manner is always working under protest, what does he care about the plough going deep enough, or whether the seeds rot and die. Indeed in the season the different sorts of cultivation can be detected in an instant. In the ryot's field the drills are as straight as an arrow, while in the model farm adjoining, they are "as crooked as a dog's leg." It is no doubt sad that what was once promising should turn out such a failure; but that the failure should be persisted with from year to year is sadder still. No doubt these "model" farms were well conceived, but it ought to be plain even to Mr. Hume himself that now their day has gone. One of the main objects in establishing them, was to introduce English machinery, and to show the natives how to work it. This has been done, but the result has only added to the confusion of those people who ignorantly clamoured about it. Mr. Ashburner acknowledged that the native plough had been found in Khandeish superior to all the English ones, so it has been in Berar, for while the native wooden ones go on ploughing up the soil triumphantly, the English ones, beautifully painted red and green, are allowed to be rotting in the ditch. And so it is with everything else attempted. A thorn bush tied at the bullock's tail is found to be as good a harrow as any brought from England! Then as to the experiments, when, oh when! shall the long weary list be completed? When shall we have one single satisfactory result? When shall we have it on the authority of the Agricultural Department that such a thing will do, and that another won't do in the dry climate of Berar? One single fact thoroughly established would be some compensation for the weary waste of money that is yearly going on. But as yet we have nothing. Year by year the same meaningless routine is being gone through, evidently without aim or object. For many years now Peruvian, American, Egyptian, and other foreign cotton seeds, have been regularly sown and reaped, and only with one result, namely—failure. The same report has annually been written upon them to the effect that they grew up, they flourished for a time, they withered away, they revived again, and at last died out, almost without fruit. Now, with any reasonable individual experimentalist, if not one trial, certainly two would be convincing and conclusive. But with the Government "model" man, who, of course, is not spending his own money, there seems to be no finishing point. The farce must be kept up until the paying country gets tired of him and bids him to stop. He will certainly never get tired and stop of his own good will."—*Times of India's Correspondent.*

To the Editor of the Times of India.

Sir,—I should like to occupy a little space in your columns to correct the false impressions respecting Model Farming in India, which I believe to be very generally prevalent, although not often brought before the public so prominently as in the letter from your own correspondent in Berar, which appears in your issue of the 23rd instant. That these false impressions are usually due to simple ignorance of the subject, does not lessen the injury caused by their propagation. Your "own" has erred in not having posted himself a little better on the subject before delivering himself so copiously on it, and his letter abounds in mis-statements, or rather false conclusions, from which a little more attention to the information actually within his reach or a visit to one of the farms he denounces, would have saved both him and your readers. I demur to each and all of his conclusions with this single exception, that I agree with him in considering that the ryot has a great advantage over the "model cultivator," in being able to make his family work on his usually small holding, whilst the European must employ hired labour. This is, however, in practice overcome by close supervision, and an intelligent organisation of the hired labour. Your "own" opens the subject with an expression of opinion that "the Khandeish Farm accounts, as disclosed by Mr. Ashburner, shew a very sad state of things indeed." He has here evidently been led astray by the use of the word "loss" by Mr. Ashburner, to indicate the difference between the total expenditure and the total receipts. But to present an exactly parallel case—does your correspondent or does any one else call the difference between the total sum expended on the *construction, maintenance,* and *working* of railway for the first three or four years of its existence, and the total traffic receipts during the same period "loss"? Is it not rather considered as "capital invested," and why should not this be the case also with respect to the Khandeish Farm? When the ground was entered upon there was not a resident labourer within an hour's march of it, not a building of any kind, nor timber or other building materials on the place (except earth). It is now a village containing over sixty inhabited houses, every cubic foot of timber in which has had to be carted over 200 miles. The land consisted of a scrub jungle overgrown with bushes, and so thickly overspread with that *curse of the district* Roonda grass, that the natives would not cultivate it at all. Is the money expended in the reclamation of 650 acres of this jungle in the erection of a village, capable of accommodating a population sufficient to work it—in the erection of store-barns, superintendent's house, cattle stables, wells, &c., in the purchase of working stock, implements, and carts—is all this "loss" in the ordinary meaning of the word? The mistake lies in confounding capital and revenue accounts together. Would any farmer in his senses undertake with the capital stated by Mr. Ashburner to have been expended on the farm to reclaim an equal amount of common land in England of the same character, and both erect the buildings and stock his farm—though labour *measured by results* is considerably cheaper in England than in India? (In agricultural labour the cost in India is nearly double.)

So far from the accounts shewing a very sad state of affairs, as the result of its cultivation is concerned, the prospect is most encouraging. It is not generally known that a great portion of the expenditure on the farm was thrown away, and a permanent addition made to the working expenses at the same time that short crops were ensured for some years by the suspension of the farm during the rubbee sowing season of 1869. No further sowing of the land, already prepared at great expense for cropping, was allowed; no expenditure on weeding or keeping clean that which had been brought into a proper state of tillage, but such crops as were in the fields were *allowed* to grow. This suspension continued until the working season was lost entirely, by which time the land was thoroughly overrun with weeds and koonda, which will take years to eradicate entirely. But is all this a proof that the European cannot compete with the ryot in cultivation, or is it not rather evidence that a farm, if dependent upon circumstances foreign to its interests, and over which its superintendent can exert no possible control, must suffer from its dependence? Your correspondent lays stress on the Government connection, as if he considers it an advantage to the "model cultivator," whereas it is in fact his principal difficulty. No man, with the Account Department always held *in terrorem* over his head, can lay his plans with the freedom which an agriculturalist should possess to adapt his work to the exigencies of our very uncertain seasons. However well he may be supported by his immediate superiors, he must always be cramped in his motions by the knowledge that every item of his estimated expenditure must be made to fit in with the ideas of half a dozen officials, who may or who may not be acquaint-

ed with the A B C of agriculture, but who cannot, under any circumstances, come to a just decision without an acquaintance with the peculiarities of the locality in which the farm may be situated. Notwithstanding this drawback, however, Government model farms ought to and *will* pay when properly supported. Witness the Madras farm, which is an older establishment than the Khandeish one, but which has been supported by the local Government until it does pay. The Khandeish farm is subject to many serious drawbacks, which gives the Madras farm an advantage over it, notwithstanding the inferiority of the soil of the latter. Its inaccessibility, or rather distance from a remunerative market; the impossibility of procuring such stores of manure as are procurable at Sydapet; the total absence of any subordinate qualified assistants to the superintendent; the presence of the Koonda grass; the absence of proper implements to cope with it; the inadequate supply of labour; and the high price and inferior quality as compared with Madras of that which is available; and last, but not least, the extraordinary uncertainty of the seasons in Khandeish and the dependence of the farm for irrigation on the Jamda Canal, which has twice entailed heavy loss on it from accidents to the acqueducts, whilst its supply of water is insufficient, and not perennial. Your correspondent is in error also, in stating that the "model cultivator" possesses an advantage over the ryot in having no land rent to pay. The Khandeish farm pays the Land Revenue and Local Fund cess on every acre, exactly as does the ryot. This is stated in Mr. Ashburner's evidence in your report, *vide* April 24th, the rate being that fixed by the Survey Department under the thirty years' lease system, when the district was last surveyed. Your correspondent states that "the ryot flourishes and grows fat, where the 'model' cultivator under Government auspices can only go on year by year heaping up a heavy load of debt," that the years which have "floored the model cultivator, have undoubtedly added to the store of the ryot," and that the latter is "free from debt than ever." This may be true of some districts, but certainly is not so of Khandeish, where the years 1868—1871 have entailed a heavy addition to the debts of the coombies whose crops have been insufficient to meet the repayment of the advances made to them by the Soucars. He says that European agency, *even backed by Government*, cannot compete with the ryot in cultivation. I have pointed out that he is wrong in the first place in supposing that the European model cultivator has no land rent to pay, and that the Government control fetters his action, and is so far an actual disadvantage. I grant that his imaginary model cultivator, "surveying from behind a 'kuskus tattie' in his bungalow, the ploughing going on perhaps a mile off," is not the man to compete with anybody. But does such a model cultivator exist elsewhere than in the imagination of your correspondent? A great deal too much is made of the danger of exposure to the climate in India. For my own part, I believe that the ordinary English farm labourer could get through quite as much work in India as he performs at home. It is not exposure that does the mischief, but coddling and intemperance. If Europeans in India lived as much in the open air as they do at home, and took as many precautions whilst out in it to guard themselves against injurious influences as they do in England, they would, as a rule, have better health than they have at home. Liver complaint and debility do not attack those who lead an active out-door life here. The sufferers are those who either from fear of exposure or from the nature of their duties are confined all day within doors. Kuskus tatties are as much out of place on an Indian farm as kid gloves would be on an English one, and the man who cannot superintend the field operations on the spot, has no more right to set up as a "model cultivator" than your correspondent has to set up as agricultural critic. The one is about as fit for a farmer as the other is to be Secretary for the new department of agriculture and commerce. The comparison instituted by your correspondent is an obviously unfair one. The ryot, as a rule, inherits his field, which requires no reclamation from jungles; he inherits a house built by his fathers, and the bullocks and implements also. He has simply to provide for the up-keep of all these. Place the European on cleared land with his buildings, implements, and stock ready to his hand, and from *that* stage institute the comparison as to results attained; but the European must be as unfettered as his darker competitor, to make the race a fair one even then. An English farmer, possessing capital sufficient to make a fair start, would undoubtedly be the best model farmer for India, and could not fail, if temperate, industrious, and intelligent, to out-distance his native competitors, as much in agriculture as they are out-distanced in every other branch of work requiring energy, perseverance, and skill. But until these can be induced to come out, Government is conferring a great boon on the country in establishing, under its own authority, model farms in every district where they may be possible.—I am, &c.,

Khandeish, May 24. VANSE FRETWELL.

MODEL FARMS.

Now that an Agricultural Department has been established in India, and a responsible head appointed to superintend the numerous but scattered attempts at agricultural reform throughout the country, it may be worth-while to enquire what the new department is intended to accomplish, and what are at the same time the most direct, the most efficient, and the most economical steps to take in attaining the end in view. We have already had enthusiastic agriculturists by the score in different parts of the country, each one generally speaking busied on some particular hobby of his own. Not only has there been a want of co-operation between them, but in many cases an actual and active antagonism. This has for the most part been due, probably, to the want of an organ for the publication of the observations of the various experimentalists in different districts, whose knowledge of the country at large has necessarily been circumscribed by the information within their reach. Thus each man has more or less been driven to advocate some speciality in produce, or some peculiar system of agriculture, which though doubtless efficacious and desirable in the immediate locality of his sphere, has been laughed to scorn by quite as practical men in other districts, the conditions of which, with respect to soil, climate, and population, were utterly at variance with those of the districts in which the experiments thus adversely criticised were undertaken. The recent establishment of an Agricultural Department and Mr. Knight's *Agricultural Gazette of India* ought to remove at once the great stumbling-block in the way of agricultural progress, *i.e.*, want of means of inter-communication amongst those interested in the agricultural advancement of the country. A great deal might doubtless be said on the subject on purely sentimental grounds. Appeals to the patriotism of a people to increase the productive capacity of their country, must however as a rule be supported by positive demonstrations, that in so doing they will also effectually subserve their own self-interest. Self-interest and not patriotism, is the inducement we must offer to the native cultivator, if we wish him to abandon the stereotyped paths of his ancestors, and enter on that of agricultural reform, which has only for a comparatively short period been followed by the English farmer with anything like confidence. But England has had to bear the cost and the loss incident to many other experiments besides those connected with agricultural reform, and other nations have simply waited the result, and profited thereby. And after all, self-interest commonly leads to the attainment of the desired good in the shortest time, and most economically.

A Berar correspondent of the *Times of India* gives expression to what is doubtless a very general opinion with reference to the model farms established already in India, but the justice of his conclusions may well be arraigned. The reply which appeared in the columns of the same paper is to a certain extent a reproduction of a report by the Superintendent of the Khandeish Model Farm which appeared in the columns of the *Agricultural Gazette of India* (vide vol. II., page 264-9) a year ago. Mr. Vanse Fretwell is right in reiterating the arguments there put forward, as on economic questions the reading public appear to be singularly apathetic, and it is only by iteration and reiteration that an advocate of reasonable views on such subjects, can obtain a following of perhaps involuntary disciples. It is the iteration, and not the logic, that convinces. Any one who will take the trouble to refer to the *Agricultural Gazette* of May 15th, 1871, will find that the Superintendent of the Khandeish Farm therein replied in anticipation to such vaticinations as those of the Berar correspondent of the *Times of India*.

Our contemporary without committing himself to any opinion on the matter, observes in the succeeding issue to that in which his correspondent's letter appeared:—"But our correspondent is only "one of many *witnesses* who concur in opinion that the industrial "and educational advantages of these model farms are of the very "smallest. Whatever they have to teach and whatever botanical "experiments are to be conducted on them, might, we think, be "carried out in less ambitious style, and by more direct contact "with the ryots." Now the Khandeish Farm is, we believe, the largest institution of its kind in India, and so far from being an ambitious project, the Superintendent has not a single qualified assistant to work with him. And notwithstanding the rather extensive area under his charge, we believe it to be a fact, that he is supposed to superintend the whole of it *on foot*, fodder for a horse having been denied him by the Government of Sir Seymour Fitzgerald in a published resolution. With this resolution before us, and the knowledge of the extent of desk work which a man in his position is bound to get through, we are not surprised that we have so little in the way of reports from our Farm. It is impossible to get twenty-six hours' work out of the day, and as something *must* be left undone, it is surely preferable that that something should not be the out-door practical work, which is all that can be brought *directly home to the ryots* of the district.

Mr. Hume's letter, dated Simla, 2nd November 1871, published in the *Agricultural Gazette of India* of December 21st, 1871, is the only intimation we have yet received of the intended policy of the new department, and so far as it goes, is a very intelligible and encouraging document. But it is avowedly put forth tentatively for discussion. It is, we think, on the whole a good scheme, but strikes us as being, if anything, rather too large. Our own ideas of the purposes for which model farms should be established in India, are something like the following:—

1st. To promote a knowledge or rudimentary agricultural chemistry, to such an extent at least as will enable the ryot to adapt his manures to the crops he requires. 2nd. To introduce new products and improve existing ones, by the selection of seed, and inducing greater attention to cleanliness, drainage, and tillage. To improve the implements ordinarily used in agricultural operations in this country, *not necessarily by the introduction of English implements*, which very frequently are found on arrival to be totally unsuited to the soil they are intended to cultivate, but by the introduction simply of English common sense, to adapt the implements which a native can use to his work, in such a manner that one man shall be enabled to perform an amount of work which, with their old-fashioned "friction producers," it now takes 5 or 6 to perform. With these objects in view, how absurd is it for Government or the public to insist on each establishment paying its own expenses *ab initio*, *i.e.*, buildings, implements, stock, reclamations, wells, out of the *excess* value of the first year's crops, over and above the capital and expenditure necessary to produce them. In the case of the Khandeish Farm, Mr. Ashburner appears to have hit the right nail on the head, in his letter to Sir Stafford Northcote, (published with Bombay Government Proceedings in the Revenue Department, 13th August 1868), in which, with reference to the appointment of a Superintendent, he proposed a fixed salary, supplemented by a liberal share in the profits of the farm, *care being taken that he does not pay undue attention to the profitable branches of the farm, to the neglect of those which are equally important but not so profitable.* Mr. Ashburner's intended farm was *never established*. Had it been, we might now probably be better able to indicate the course which the new department will find it best to follow. We are confidently assured that if the whole of the papers connected with the Khandeish Farm were published, the only surprise which would be manifested would be that it was in existence at all. There was not allotment of funds for it in 1868 at all in the Budget. In 1870-71 it had to go begging to the Cotton Frauds Department, and would have perished but for the championship of Mr. Watts, the Secretary of the Cotton Supply Association. On each occasion when a grant was made for it on the recommendation of the Bombay Government, the very same Government resolved that only half the grant (previously cut down to the lowest possible figure) should be made available.

There is an immense difference between the Cotton Department operations, and those of a permanent farmer. The former with a permanent residence and a salary not charged in his account of operations, is allowed to take up the best land in his vicinity, and cultivate it for *one season only* with cotton. The Superintendent of the Model Farm has to take the *jungle*, and clear it, and by a judicious system of alteration of crops prove to the ryot how it may be made to yield perennial crops without lying fallow at all. Does the Berar correspondent of the *Times* regard the fields taken up *temporarily by the Assistant Superintendents of Police* in Berar, as the model farms of the Government of India. We are afraid he does. A few Kew gardeners are got out from England, and empowered to take up 100 to 200 acres of already cultivated land from a native occupant for a year. Their experiments are carried out thereon with no charge for clearing jungle, or for European superintendence, and the next year they take up other lands. But is this a model farm at all?—*Indian Statesman.*

OUR MINOR TORMENTS.

THE MUSQUITO, &c.

But what are all the infections that the sun sucks up from bogs, fens, flats, all the plagues and pests I have been enumerating, compared to the dread musquito?—the persistent plague of everyone throughout India—a creature which is heedless of climate or latitude, and swarms as much by the rivers of Canada, Lapland, or Australia, as in the torrid heats of Hindustan and Burmah. In Bengal, I found them most numerous in Calcutta, their numbers diminishing as you travelled higher up the country. In Madras they were terrible. The first night I slept there (at Grant's Hotel) —I was but a youngster—I dispensed with musquito curtains, having boasted to everyone that gnats never touched me in England. The consequence was, I was so dreadfully bitten that it threw me into a slight fever, and I was obliged to apply lemon juice for several days to my face, hands, and body, before the irritation subsided. But nowhere have I met with so many musquitoes as in the creeks in Lower Burmah or Pegu, and on the Atarau river in Tenasserim. Some idea may be formed of their numbers when I say their united humming was like the bowling of the wind. By sunset the air was thick with myriads of their tiny bodies. Every instant bites would be tingling on the person, and to sit or stand still in the open air was simply impossible. I and my companions, travelling without tents, have been obliged to eat our evening dinner with our chairs and the table placed upon a raised bamboo floor, underneath which a fire of green wood was lit, enveloping us all in smoke: but there was no choice between being devoured piecemeal! It is a well-known fact that in 1853 when a detachment of troops were proceeding in boats up the Sittoung river in Burmah, many of the men, maddened by the musquitoes, jumped overboard, running all risks from the sharks and crocodiles, and there remained holding on by ropes, and immersed in water. One soldier was drowned in so doing.

There are three conspicuous species of musquito in Burmah and India—a brown one exactly like our English gnat, with which perhaps it is identical; a grey fellow with ringed legs, the hindmost pair of which he keeps elevated while resting on a wall, as if he were feeling for your approach; and thirdly, a large black kind, which haunts low, humid forests, and is luckily rare, for his stab is terrible. There is also a fourth and diminutive species, generally called "sand fly," found by all sandy rivers, which is perhaps worse than any: for the ordinary musquito curtain will not exclude it, and it is necessary, in order to secure some chance of sleep, to double the curtains, thus half suffocating the miserable inmate with heat. Natives manage to sleep wrapped up, head, face, and all, in a sheet: but to a person unused to the custom, it is impossible to bear many minutes the oppressive warmth thus generated.

Now, the strangest feature in all this is that the Chinese, who are just as much infested in the interior with musquitoes as we are in Bengal, keep them completely off by hanging up in their rooms or boats pieces of a certain resinous wood, which, on being set on fire, effectually prevent the ingress of these insects so long as they are burning. The wood consumes very slowly giving out no disagreeable smell, and being a common jungle shrub, is as cheap as dirt, and available to the poorest classes: and yet we English do not give ourselves the trouble to import this easily obtainable article, which would positively be a blessing in Bengal or Burmah.

The sea shore along the coasts of the Bay of Bengal has its "pests," not to speak of sharks and crocodiles. A small fish of the Bhagrus genus buries itself in the sand leaving its dorsal fin, which is armed with a virulent barbed spine, sticking up so as to run into the foot of anyone who should trample on it. I have been eye-witness to an accident of this kind, and the wound appeared to cause great anguish for some hours. That curious animal the Limulus or king crab has the same propensity, and its sharp dagger-like tail, which is held perpendicularly, causes most serious wounds to the sole of the foot if trodden on.

At the hill sanitarium of Darjeeling the guinea worm or Dracunculus is very common, and many natives were under treatment in the hospital for it in 1842. I do not know if it is equally numerous in the other hill stations. In the Tenasserim hills I never heard of it.

Leeches in India are numerous. There are two principal kinds of them—a small active one which infests the hill forests from 2,000 ft. about sea level to near the snow line, and a great fellow like an eel, which is found in paddy fields when swamped in water. The first are land leeches, and troublesome from their numbers, but cause nothing worse than itching, though they draw blood freely. Nothing keeps them out; I have had them inside a worsted stocking in spite of leather gaiters, and down my neck by dropping from a bough into the collar of my coat. After a day's shooting I have divested myself of as many as six or seven from one leg, and found it an hour's job to staunch the blood flowing from perhaps a dozen bites. At Darjeeling and the hills about Kathmandoo they are very numerous; but I was never annoyed by them in the Tenasserim mountains, though, according to the Rev. F. Mason, in his valuable and interesting book on the productions of Burmah, they are very troublesome in that country. In the cold weather they disappear, and probably pass the season in a torpid state, and are most active in the rains. In Ceylon I believe they are more numerous than in the Himala. The large leech of Bengal, or buffalo leech as he is sometimes called, is a really formidable creature, being when extended from 6 in. to 7 in. in length. It is found in the paddy field while the ground is under water, and attacks every living thing that enters the swamp. When snipe shooting, I have been much disturbed by seeing four or five of these odious animals swimming after me, which they do pretty rapidly with an undulating or serpentine movement; and if they manage to stick on to you and to insinuate their heads through the joinings of your dress, they will fasten on to the flesh, and draw a most inconvenient amount of blood. In 1830, I went one day with two or three artillery youngsters like myself, into the paddy swamp near Dumdum shooting, and one of our party, who had neglected to tie his trousers with a string close to the ankles, was so severely bitten and sucked that we had to support him part of the way home. He must have lost a pint of blood. I was taught in Bengal a mode of detaching a leech, which does not appear known to Europeans. It is to touch them with the freshly cut portion of a piece of onion. It makes them shrink and tumble off immediately, when salt often fails.

Bringing up the rear of all the delights of India which I have endeavoured to depict, "last though not least, in our dear love" is the jungle tick, the "atalee" of the Eastern Bengalies, and "hmoe" of the Burmese, which infests the underwood in all the forests, and the elephant grass in the swamps. It is in shape similar to the dog tick, but smaller, and has a faculty of penetrating the epidermis as

far as the cuticle, or true skin, before it is felt and discovered. The inconvenience consists in an intense persistent itching: you seek for the cause, and perceive a little livid globular body, smaller than a pea, the extremity of which is just visible outside the skin, and which you cannot extract without considerable pain, and bringing away shred of the inner cuticle adhering to the abominable creature's claws. Sometimes the inflated belly you have hold of tears away from the thorax, which remains embedded in your body, rooted there by the sprawling legs, and causing painful inflamation before it is ejected by the repellent action of a faster. The natives withdraw it by applying green ginger or turmeric to the animal, which will then slowly relinquish its hold, or offer no resistance to being lugged out.—*Field.*

AN OUTSIDER ON INDIGO.

To the Editor of the Indian Observer.

SIR,—While on a tour lately in Behar, I found much to interest men in the present financial position of indigo. I used my eyes, and I made inquiries; and the result of all was that I determined to lay the fruit of my investigations before your readers. It will probably teach nothing to those who are familiar with indigo; but the general public who, as a rule, are supremely ignorant of—if not indifferent to—such questions, may be glad to know what little I can tell them.

To those who come fresh to the study of the indigo question, it must appear to be somewhat of a paradox that, whilst many large fortunes were made when the market rate of indigo varied from one hundred to one hundred and fifty rupees for a factory maund, comparatively few concerns now return to their owners a fair rate of profit, although the maund sells generally for between two hundred and fifty and three hundred rupees. The cause of this decrease in profit is not, as might be supposed, that less indigo is produced by the factories; for it is notorious that, not only has the area of cultivation been considerably extended, but superior skill has actually increased the amount of plant grown on every bigah. The increase of cultivation itself would seem to be one of the causes of ruin to the grower. Indigo depending, as it does, so greatly on the state of the weather is at best a risky crop. Too much moisture, or too little, makes the chances of the seed germinating less probable; excessive heat, when the plant has arrived at a certain stage, diminishes its vitality; and lastly, rain at cutting-time either destroys the plant entirely, or deprives it of so much of its colouring matter as to reduce to a minimum the amount of dye extracted from it. The planter, then, who formerly cultivated one thousand, and now holds three thousand bigahs of indigo, in a bad year has trebled his loss; and while with his former acreage he might possibly have found from his own capital money enough for next year, with an increased estate, he has no resource but to apply to agents or bankers, European or native.

This brings me to what is the real obstacle in the way of many a planter. It is the necessity of paying a very high interest for a large sum of money, in order to keep his business going. The following case is no uncommon one:—A planter who, after years of toil as assistant and manager of some other person's factory, has accumulated some little money from savings of his salary and commission which he receives on the profits resulting from his management, hears of some factory for sale. He has not quite money enough to buy it; but he raises the balance by giving a bond for a short period to a native banker at more or less usurious interest. The sale of the factory is completed, and he becomes the proud proprietor of what is called the 'block' of his factory, that is, the buildings and grounds of the factory itself, with the right and title to all unexpired leases and contracts. But money is now required to pay the rent of the lands of which he has become lessee, to pay the factory servants, to advance to the cultivating ryot—in fact to provide for all the current expenses, without which he will never fill his vats with the plant which is to recompense him for all his labours. He applies to an agent, who advances him the sum which he requires for his outlay; but to this agent he will have to pay, from first to last, some eighteen per cent. on the money borrowed. Here at once is a large bite out of his possible profits. But meanwhile, the bond becomes due; and it becomes apparent that the only way to pay it off will be by a mortgage on the factory. Here arises another difficulty. Few, if any, of the old Behar factories have title-deeds which perfectly satisfy the mind of an English lawyer. Such a man is generally the legal adviser of European banks and agents; and such firms are accordingly induced to look shyly on mortgages of this kind of property. The result is that the mortgagee is generally a native, which means twenty-four per cent. interest; and thus another large stone is hung round the neck of the planter. Add legal proceedings with neighbouring zemindars, who generally try the mettle of a new comer by placing every possible difficulty in his way, and then crown the edifice with a bad season, and you may think the cup of misery is full. But think of two, or even three, such bad years in succession, and what is the result? The agent has become chary of making advances, not believing much in the practice of throwing good money after bad; the mortgagee, clamorous for his interest, threatens legal proceedings: the zemindars around, well-knowing that money is required for law suits, openly lay claim to and covertly steal as much land as they think they can possibly hold by fair means or foul; and a sick wife and growing children at home require money for sustenance and education. The once thriving manager, now bowed by years of toil and by sorrows that whiten the hair more surely than age, passes through the stages of insolvency and ruin, and becomes, possibly, an assistant to some one to whom, ten or twenty years before, he had taught the rudiments of his business. Although it is an undoubted fact that some men have commenced on borrowed money and retired with considerable fortunes years afterwards, yet it seems to me an axiom that to grow so risky a crop, requiring so large an outlay, with only borrowed capital to go on, must, in most cases, prove a ruinous failure.

Another cause which commends itself at once to an inquirer, is the extremely high rate which zemindars exact from factories for lands given in lease to them. In many parts of Behar the only way in which land for indigo can be obtained, is to lease from zemindars whole zemindaris. The zemindar not unfrequently exacts one-fourth or one-third more than the actual amount of rent which can be collected from the ryots. The factory then can only recoup itself by inducing a very large number of the ryots to cultivate indigo; so that the amount of plant grown may pay, not only a fair profit on the expenses of cultivation, but also the whole amount of deficiency in the rent collected by the factory from that which it pays to the zemindar. Hence, in bad years, the losses of the factory are swelled by the whole amount which the leasing zemindars have exacted over and above the actual rents collected from the zemindaris.

Another cause of loss seems to be the steady deterioration of the lands from being continually sown down with the same crops. Partly from the number of indigo factories having largely increased, partly from the system of long leases, and partly because cartage expenses are saved by sowing lands adjacent to the factories, year after year the same lands are used to grow indigo, and, except in comparatively rare cases, are not manured. Very many planters will demur to the assertion that the indigo grown on these lands must surely deteriorate; but, even against the opinion of those possessing special technical knowledge, I cannot but hold to the position which is now taken by all scientific agriculturists, that without careful rotation of crops the productive powers of land decrease; and, as far as personal observation goes, this position has been rather strengthened than otherwise in the matter of indigo. Increase in the price of labour, active competition for land, and increased cost of fodder for cattle and food for servants have doubtless all of them had their weight in reducing profits: but the causes I have minutely detailed above would seem to be those which more surely cause the decline of the fortune of the indigo planter. Nor has the trade a much brighter outlook for the future. The high prices obtained in Russia and elsewhere for the dye, have caused its cultivation to be introduced into Guatemala and Egypt, and even (I am told) into Brazil; whilst, last year, the invention was announced of an aniline blue of indigo colour, the preparation of which only needs to be perfected to make it a serious rival to the Indian drug.

MUS URBANUS.

[Our correspondent has, no doubt, used his eyes to good purpose; though it needs no prophet to tell us that if a man attempts to work any large concern on borrowed money, he must be exceptionally lucky if he avoids bankruptcy. We are, however, very much inclined to doubt the general accuracy of his statement that the prospects of indigo are so gloomy. We have certainly known instances, within our own experience, of very large profits having been made in Tirhoot within the last few years. It must be remembered also that in former years indigo was cultivated exactly as it is now, namely, on borrowed capital; and the rate of interest was then 18 per cent., while it is now only 12 per cent. The rise in the price of indigo is, of course, only one instance of the rise in the price of all staples alike—oil-seeds for example, sell at three times their price of 20 years ago; it merely illustrates the fall in the value of money which attends increased commercial operations, and which is felt just as much in the advanced rate of wages as in the increased price of commodities.—ED. *I. O.*]

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

THE Secretary read the following memorandum regarding a trial made of preserving seed in ice:—

In February 1869, Dr. James Irving, Civil Surgeon, Allahabad, suggested that a trial should be made for preserving the germinating power of imported seed by placing them in ice. This suggestion was overlooked that year, but in the following year, October 1870, a tin parcel of American vegetable seeds, carefully soldered, was placed in the pit of the Ice House. A parcel of Australian vegetable seeds, similarly packed, was retained in the Society's seed room. In October last (1871) both packets were transferred to Mr. Scott, Curator of the Royal Botanic Garden, who reported that the American seeds had entirely lost their vitality, whilst the

Melbourne seeds looked good. A trial sowing was made of the latter, under Mr. Scott's superintendence, and the result is altogether satisfactory, as shewn by the annexed report. Of the 21 kinds sown, 3 entirely failed, but the others gave a percentage of from 10 to 50, or a general average of 24 per cent.

The Grant gold medals awarded to Mr. J. F. W. Watson and Colonel Edward Money, for the best Essays, on the cultivation and manufacture of Tea, were placed on the table and much admired. It was *resolved* that the best acknowledgments of the Society be tendered to Colonel Hyde, Master of the Mint, for his kindness in having these handsome medals prepared at the Mint.

BLIGHT IN MANGOE TREES.

Colonel C. Reay, writing from Benares, 27th March, refers to a blight then attacking the mangoe blossom, and enquires if any remedy be known for it.

"Can you tell me," writes Colonel Reay, "whether there is any remedy known for a kind of blight known by the natives under the name of "lyee" (pronounced "lie") which has this year attacked and destroyed many of the best Bombay mangoes when in blossom. The flower has withered away leaving no fruit, and the leaves are covered with a slimy substance just as if they had been varnished, which dries and is sticky, like bad varnish. There are thousands of small flies, and the natives seem to have no remedy against the disease. "The season promised to be very good for mangoes, but many trees will now be fruitless. The hot winds have set in unusually early, and do much damage to gardens, though good weather for the harvest."

The Secretary read the following remarks with which he had been favoured by Mr. John Scott on the above subject:—"The blight on the mangoe trees, referred to by Colonel Reay, seems to be what is called 'honey-dew.' In the gardens here I have occasionally observed it on mangoes, peaches, and various other trees. It is very injurious to vegetation, as under it the leaves, &c., become covered with a viscous substance (whence doubtless the native name *lyee* or *lie*, a corruption of *lac*, gum) which suppresses respiration. Hot and dry weather favour its development. It seems to have its origin in the attack of aphides or green-flies, and the character it assumes is apparently due to exudation from their punctures in the leaves, combined with their natural excretions. The most effective, and indeed the only really practicable remedy for the disease in arborescent plants, is copious syringing, either with plain water, or that mixed with soft soap. It must of course be applied with a good garden engine. In cases where this disease has got fairly ahead, and not attended to until the trees are in blossom, it is of course impossible to save the crop: syringing them to cleanse the affected parts will also destroy the blossom; it should thus be practised prior to the expansion of the flower."

FLOWERING OF THE BAMBOO AT JUBBULPORE.

In an interesting communication from Colonel C. S. Ryder, on other subjects, he alludes to the recent blossoming of the bamboo at his station in the following words: "Now have you ever heard of this. If when those beautiful clumps of bamboo flower and *seed*, they die and we have lost one of the great beauties of the station. I was told two or three months ago, that if you cut the bamboos down to somewhere near the ground when they are flowering, they grow up again and do not die. I wish I had known it a year earlier, I might have saved our ground clumps, some of them 50 and 60 feet high. Perhaps it might be cut down only a foot or two below the flowering part, and it would do as well or better. I thing it would be well if this was more known than it is. The bamboos that are cut are all in prime order for any use. If not cut down in time they seed and the bamboos die, roots and all. Well, I had two small but very pretty clumps in the public gardens which had escaped last year, when almost all the bamboos died. They began to flower and I thought of their cure, cut them down leaving a foot or two feet above the ground. They have both thrown out long thin shoots from what was left, and I consider have been saved from a certain death, and will grow now for the next 30 or 40 years."

Remarks by Mr. Scott.—"With reference to Colonel Ryder's remarks on renewing the life-term of bamboos, by cutting them down while flowering, I should think it can be but temporarily. Since I received Colonel Ryder's letter from you, I have been looking to the several specimens of *B. spinosa*, which are flowering in the Botanic Garden here, and I observe that many of those which have had a few of their culms lately cut down in place of giving rise to leaf-shoots only, are all flower-bearing even as the last and preceding year shoots. Now, though these clumps were only in part cut, I see no reason why they should all give rise to flower-shoots, if in the case of cutting down a whole flowering clump, leaf-bearing shoots only spring up. I have however made the experiment, and shall in due course report the results with other observations which I am making on the flowering of bamboos. In the meantime I may state as partly confirmative of Colonel Ryder's authorities, that as it happened two clumps of *Bambusa spinosa* were completely cut down about a year ago, and that these are now the only non-flowering specimens of that species in the garden here. How long they may continue non-flowering, remains to be seen. As showing that these would have flowered if left uncut, I may state that many of the cut culms were buried lengthwise along one of the garden boundaries with the view of raising a fence from them—a not uncommon mode of multiplying bamboos. They succeeded well, and in the second year gave rise to vigorous shoots, which, like the uncut clumps of the original progeny, have all burst into flower. This remarkable fact shows how strongly the individuality is retained! so it is also by root division."

In a subsequent communication, Colonel Ryder announces that the stumps from which he had cut the bamboos had thrown out branches, or rather shoots, which flowered uncut, so that will be of no use. Mr. Scott observed that he suspected what the result would be with the cutting down of these flowering bamboos; the flowering effect is a concentrated and exhausting one, and he should have anticipated that it was then too late for any chance of renewal from cutting the flowering shoots down; the casual observation, however, in a previous letter shows that if cut down prior to the commencement of flowering, the life of the plant may be temporarily prolonged.

In connection with the foregoing, the Secretary drew the attention of the Meeting to some interesting particulars, relative to the age and flowering of the bamboos in Rohilkund and Central India which were brought to the notice of the Society so long ago as February 1842. He read extracts therefrom to show that every portion of the plant died out after such flowering, though he had heard it contended that such was not the case, but that the old roots still retained their vitality from whence new shoots sprung out.

TERRESTRIAL ORCHIDS FROM THE NEILGHERRIES.

The Secretary next submitted extracts of an interesting communication of 10th February, from Mr. Grote, relative to certain subjects which had recently come before the Society, and alluded especially to one portion relative to Mr. Wynton's letter regarding the tubers of a terrestrial orchid from the Neilgherries, known as "little man's bread," which was read at the meeting in December last. Mr. Grote observes, "the December Proceedings reached me last week. You will find a figure of the terrestrial orchid in Wight's *Icones* which furnishes the *salep* tubers, or 'little man's bread'; at least I think so, the flower is pink with a double spur, it goes off in October and November."

In a subsequent part of the same letter, dated a day later, Mr. Grote adds:—"I have just got the *Gardener's Chronicle* of yesterday, which I know you take in. See Major Benson's letter from Madras, at page 182: he there gives an account of the orchids which he met with in the Neilgherries, and refers the salep-mistree tubers, noticed in your December Proceedings, to the *Platanthera mantha*.

The Secretary mentioned that Wight's *Icones* in the Society's library being incomplete, he had referred the foregoing extracts to Mr. Scott, who offers the following remarks thereon:—

"With reference to Mr. Grote's remarks on the *little man's bread*, I have looked into Wight's *Icones*, but I really cannot make out the plant he refers to as yielding the salep. I know of no orchid normally producing a *double* spur, as Mr. Grote says the species referred to has. The most likely of those figured in the *Icones* is *Eulophia microstachya*, which has a roundish inflated and somewhat bilobed spur. The pseudo-bulbs of this species however are considerably elongated, not oblong or globular as those must be which form the 'little man's bread'. I note Colonel Benson's remarks on the *Platanthera mantha*, the tubers of which are the salep-mistree of the natives, but probably distinct from the 'little man's bread' of Mr. Wynton.

FLORICULTURAL NOTES.

In his communication already referred to, Colonel Ryder alludes to the seeding at Jubbulpore and in its vicinity, of certain climbing plants which are generally propagated by cuttings:—

"Another thing I have found is that the Petræa seeds here, not a flower falls, but it bears its little one seed. I have had quantities of the flowers gathered, and I send you a specimen of the seed. Colonel Poulton who has been at Sagur for some years, found that the *Bougainvillea* seeded, and if the ground round it was carefully swept when the flower had fallen, a certain amount of seed (like a small grain of wheat or rather oat, a great deal smaller than a grain of either of course). I am keeping a careful look-out for the seeds of all these things, creepers and English flowers, for this place seems peculiar in that way. I fancy there are a number of plants and creepers that get acclimatized, the climate and soil seem to agree with such a number. The *Tecoma Jasminoides* seeds plentifully, and I believe the *Bignonia venusta* does so also, for I notice that the flowers have their seed vessels large and quite noticeable, while the flower is blooming. I shall be glad to send you seeds of all these creepers as I get them."

The Secretary remarked that none of these climbers that he was aware of, yield seed in Calcutta, and he had therefore requested Colonel Hyder to send as much as he could gather of each sort. Mr. Scott observed that with the exception of Petræa, none of the others produce seeds in the Royal Botanic Gardens.

The Rajah Suttyanund Ghosal, Bahadoor, submitted a healthy plant in flower, of *Anthurium Scherzerianum*, for which ten marks were awarded.

PROFITS OF CULTIVATION.

NORTH-WEST PROVINCES.

BHOGNIPUR.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	m. s. ct.	Produce. Price. Rs. a. p.	Expenses.	
Jowar	6 Bighas	Grain	5 0 0	18 0 0	Seed	0 1 0
					Weeding	2 4 0
					Watching	3 0 0
					Cutting	0 12 0
						1 8 0
				48 0 0		7 12 0
Bajra	2 Bighas	Grain	12 20 0	29 0 0	Seed	0 1 4
					Weeding	1 12 0
					Cutting	0 8 0
						0 4 0
				29 0 0		2 9 4
Cotton	2 Bighas	Cotton	3 0 0	5 0 0	Seed	0 2 8
					Weeding	1 0 0
					Picking	0 4 0
				5 0 0		1 6 8
				53 0 0		11 12 0

SPRING CROPS.

			m. s. ct.	Rs. a. p.		
Wheat	2 Bighas	Grain	10 0 0	20 0 0		0 0 0
					Ploughing	14 0 0
					Seed	2 0 0
					Manure	0 4 0
					Cutting	1 0 0
					Threshing	3 0 0
				20 0 0		20 12 0
Barley	7 Bighas	Grain	2 20 0	30 12 0		2 10 0
					Seed	5 6 0
					Cutting	3 8 0
				30 12 0		11 8 0
Grain	1 Bighas	Grain	0 0 0	0 10 6		0 8 0
					Seed	0 12 0
					Cutting	0 8 0
						1 10 0
					Rent	69 11 0
					Plough	2 0 0
				0 10 6		105 0 0
				110 0 0		
				73 0 0		11 12 0
				184 0 6		117 5 0
					Profit	66 0 0

A very high sandy Pergunnah where the rent extend is probably too high an average

RASULABAD.

SPRING CROPS

			m. s. ct.	Rs. a. p.		
Barley	5 10	Barley	26 0 0	25 12 0	Seed	4 0 0
					Weeding	1 14 0
					Watering	3 0 0
					Cutting and thrashing	4 0 0
				26 12 0		12 14 0
Wheat	3 0 0	Wheat	21 0 0	30 6 0	Manuring	1 11 0
					Seed	3 12 0
					Weeding	1 8 8
					Watering	3 0 8
					Cutting and thrashing	3 0 0
				30 0 0		13 4 0
Grain	1 Bigha	Grain	2 4 0	4 12 0	Seed	0 13 0
					Cutting	0 1 0
						1 0 8
						27 2 8
					Tools	10 10 0
				4 12 0	Rent	62 8 0
				61 11 0		100 4 8
				153 15 2		25 5 4
				217 13 2		125 9 10
					Profit	92 3 4

RASULABAD.—Continued.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	m. s. ct.	Produce. Price. Rs. a. p.	Expenses.	
Jowar	8 10	Jowar	21 10 0	31 0 0	Seed Jowar	0 16 0
		Arhar	7 8 0	5 9 8	Other	1 4 5
		Mash	2 24 0	8 10 3	Weeding	4 12 8
		Mung	2 24 0	5 5 0	Cutting	3 3 0
		Pic	0 13 0	1 0 0		
		Rosal	0 20 0	1 5 2		
				53 12 4		9 11 4
Cotton	3.0	Cotton		53 12 4	Manuring	1 11 0
		Til	p. bigha	1 0 0	Seed	0 14 0
		Castor	12 0 0	2 0 0	Weeding	2 13 0
		Arhar	4 28 0	11 3 6	Picking	0 12 0
				67 15 10		6 8 6
Maize	3 Bighas	Corn	25 0 0	19 3 0	Seed	0 5 0
					Weeding	1 11 0
				19 3 0		2 0 0
Cane	10 Bighas	Sugar	3 10 0	15 0 0	Manuring	0 [illegible] 0
					Cuttings (seed)	2 0 0
					Weeding	1 6 6
					Watering well	1 14 0
					Cutting, and Pressing	1 13 6
				15 0 0		7 6 6
				153 15 2	Profit	25 5 4

BIHARI LALL.—DEPY. COLLECTOR.

AUTUMN CROPS

			m. s. ct.	Rs. a. p.		
Cotton	1 Manjha	Cotton	1 10 0	7 8 0	Manuring	1 0 0
		Arhar	2 0 0	2 0 0	Seed	0 4 0
		Castor	0 20 0	1 0 0	Weeding	1 11 0
		Til	0 10 0	1 0 0	Cutting	0 3 0
		Fodder	2 0 0	0 8 0	Cleaning	0 12 0
		Stalks		0 4 0		
				12 4 0		3 15 0
Cane	1 Manjha	Sugar	0 20 0	26 0 0	Manuring	1 0 0
		Castor	0 20 0	1 0 0	Seed	1 0 0
		Stalks		0 4 0	Weeding 3 times	2 4 0
					Cutting	1 0 0
					Share of press	1 8 0
				27 4 0		6 12 0
Jowar	4 Bighas	Grain	16 0 0	21 3 0	Seed	1 0 0
		Urd	1 0 0	8 0 0	Weeding	3 12 0
		Arhar	1 0 0	1 0 0	Watching	0 13 0
		Fodder		8 0 0	Cutting	3 0 0
					Cleaning	2 0 0
				41 3 0		10 8 0
Dejhar	2 Bighas	Grain	5 0 0	8 0 0	Seed	0 8 0
		Mung	2 0 0	4 0 0	Weeding	1 8 0
		Arhar	2 0 0	2 0 0	Watching	0 6 0
		Fodder		3 0 0	Cutting	1 0 0
					Cleaning	0 12 0
				17 0 0		4 2 0
				97 11 0		25 5 0

SPRING CROPS.

			m. s. ct.	Rs. a. p.		
Wheat	1 Manjha	Grain @ 25	27 0 0	43 3 9	Manuring	4 0 0
	3 Har	Mustard	1 0 0	4 0 0	Seed	4 0 0
		Fodder	34 0 0	9 8 0	Weeding	2 1 0
					Watching	0 13 0
					Cutting	1 14 0
					Cleaning	2 12 0
				56 11 9		15 8 0
Gugal	2 Har	Grain	12 0 0	17 2 6	Manuring	2 0 0
		Mustard	0 20 0	2 0 0	Seed	2 0 0
		Fodder	16 0 0	4 0 0	Weeding	1 2 0
					Watching	0 6 0
					Cutting	1 8 0
					Cleaning	1 0 0
				23 2 6		8 0 0
Grain	1 R M.	Grain	9 @ 3 2	10 0 0	Seed, 25 seers	1 0 0
		Fodder	12 0 0	3 0 0	Watching	0 3 0
					Cutting	1 0 0
					Cleaning	0 6 0
				13 0 0		2 9 0
				92 14 3		25 1 0

HAMED HOOSEN.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ch.		Rs. a. p.			Rs. a. p.
Sugar-cane	1 Manjha.	Sugar	6 0 0	25 0 0	Seed 25 s. @ 80		3 0 0
					Manuring		1 0 0
					Canal Irr. rate		2 2 0
					Labour		0 15 0
					Mill, &c.		2 3 2
					Hire of boiler		1 0 0
					Weeding		1 8 0
					Rent		3 12 0
							15 10 2
Indigo	1 Manjha.	Seed	2 0 0	16 0 0	Seed 2½ s.		0 9 0
					Irrigation rate		0 15 0
					Labour		0 5 0
					Cutting		0 9 0
					Weeding		1 8 0
					Rent		3 12 0
							7 10 0
Cotton	1 Manjha. 1 Har.	Cleaned cotton		24 0 0	Seed 10 s.		0 8 0
					Weeding		1 8 0
					Rent		6 4 0
							8 4 0
Jowar	4 Har	Jowar	12 0 0	18 0 0	Seed 10 s.		0 8 0
		Arhar	4 0 0	5 0 0	Weeding		1 8 0
				23 0 0	Rent		10 0 0
Hemp	10 Bighas.	Hemp		8 0 0	Seed 12½ s.		0 5 0
					Rent		1 4 0
Marua kakaundi	1½ Bighas.			8 0 0	Seed		0 1 6
					Rent		3 12 0
Maize	2 Bighas	Maize	5 0 0	10 0 0	Seed		0 5 0
				108 0 0			49 4 0
					Profit		58 11 6

SPRING CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ch.		Rs. a. p.			
Wheat	4 Bighas	Gaughani	10 0 0	50 0 0	Seed 3-5		6 4 0
	1 Goonta.	Berlet	15 0 0	.....	Manuring		1 0 0
	3 Har.				Irrigation rate		3 12 0
					Labour		2 8 0
					Reaping		2 4 0
					Rent		12 8 0
							28 4 0
Barley	2 Goontas	Barley	22 0 0	35 5 3	Seed 1m. 35s		3 0 0
					Irrigation, well		6 0 0
					Reaping		1 2 0
					Rent		10 0 0
							20 2 0
Gujai	1 Bigha.	Gujai	8 0 0	11 8 0	Seed 37s		1 10 6
					Canal rate		0 15 0
					Labour		0 10 0
					Reaping		0 9 0
					Rent		3 12 0
							7 4 6
Bejhar	3 Bighas.	Bejhar	18 0 0	27 0 0	Seed 2m. 12½s		3 12 0
Peas	1 Bigha.	Peas	3 0 0	3 0 0	Canal rate		2 13 0
					Labour		1 14 0
					Reaping		1 11 0
					Rent		7 8 0
				30 0 0			17 10 0
					Threshing		2 8 0
					Tools		4 0 0
				120 11 9			69 12 6
					Profit		147 5 9

CHATARBHARI LALL.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ch.		Rs. a. p.			
Indigo	1 Manjha	Seed	2 0 0	16 0 0	Seed 2½s		0 9 0
					Irrigation Canal rate		0 15 0
					Labour		0 10 0
					2 Weedings, 16 men		2 13 0
				16 0 0			1 14 0
Cane	1 Manjha.	Sugar	6 10 0	25 0 0	Seed 2,500		3 0 0
					Manuring		1 0 0
					Irrigation Canal rate		2 2 0
					Labour		0 10 0
					6 Weedings, 1 man		3 0 0
					Pressing		4 0 0
				25 0 0			18 12 0
Cotton	2 Manjha.	Cleaned Cotton		16 0 0	Seed ss.		0 0 3
		Castor oil seed		4 0 0	2 Weedings, 2 men		1 8 0
					Picking		2 0 0
				20 0 0			3 11 3
Jowar	4 Har.	Grain	24 0 0	36 0 0	Seed		0 14 0
		Arhar	18 0 0	22 0 0			
		Mung		1 0 0			
				4 0 0			
				63 0 0			0 14 0
Maize	20 Bighas	Maize	8 0 0	10 0 0	Seed 2½ seers.		0 2 0
					Manuring		2 0 0
					2 Weedings, 2 men		1 8 0
				10 0 0			3 10 0
				127 8 0			11 2 3
					Profit		116 5 9

SPRING CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ch.		Rs. a. p.			
Wheat	1 Goonta	Gaughani	7 0 0	14 0 0	Seed 100 s @ 10		0 4 0
	3 Har	Har	5 20 0	53 0 0	Manuring		1 0 0
					Well Irrigation		3 12 0
					Canal Irrigation		2 13 0
					Labour		1 14 0
				67 0 0			15 11 0
Barley	2 Goontas	6a 2bs	8 0 0	17 12 0	Seed 6a 5s		2 0 0
					Lift		1 14 0
					Labour		1 4 0
				12 12 0			5 2 0
Bejhar	3 Har	6a 2bs	18 0 0	25 11 0	Seed 7½s, @ 2½		3 12 0
					Lift		2 13 0
					Labour		1 14 0
				2 11 0			8 7 0
Gujai	1 Har	6a 2bs		10 7 0	Seed 2½s @ 20		1 4 0
					Lift		0 15 0
					Labour		0 10 0
				10 7 0			2 14 0
					2 Plough-men		74 0 0
					1 year cost of Well gear		1 13 4
					Tools & repairs		5 0 0
					Rent		62 8 0
				95 11 0			155 15 4
							60 0 0
							95 5 9
					Profit		126 6 5

DERAPUR.

SPRING CROPS.

Crops.	Area.	Produce. Quantity.	m. s. ct.	Price. Rs. a. p.	Expenses.	
Bejhar	1½ G. 2 L. 6 Har.	Grain	33 0 0	11 4 0	Ploughing	6 0 0
		Mustard		5 4 0	Seed	7 8 0
		Kassum	1½ 0 0	0 8 0	Other seed	0 10 0
		Khar	0 15 0	0 6 0	Irrigation 1½ bighas	2 1 9
		Linseed		3 12 0	Watching	2 0 0
					Reaping, &c.	7 11 6
					Threshing	3 12 0
				51 2 0		29 11 3
Maize	1½ Goonta	Maize, &c.	6 0 0	4 8 0	Manure	1 0 0
				0 12 0	Ploughing	0 4 0
					Seed	0 1 0
					Weeding	2 4 0
					Cutting	1 0 0
					Watching	1 0 0
				5 4 0		5 9 0
Wheat	1 Manjha	Grain	10 0 0	16 0 0	Manuring	10 0 0
		Mustard	1 20 0	6 0 0	Ploughing	0 15 0
					Seed	1 9 6
					Well Labour	0 13 0
					Cutting and thrashing	2 0 6
				22 0 0		15 6 6
					Rent	62 8 0
				78 6 0		113 3 3
						31 14 3
						66 9 0
					Profit	101 6 3

BEHARI LALL.

Do. FUSLI CROPS.

AUTUMN CROPS.

			M. s. ct.	Rs. a. p.		
Maize	1 Goonta	Grain	4 0 0	4 9 0	Manuring	1 0 0
					Seed	0 5 0
					Weeding	1 11 0
					Watching	0 4 0
					Cutting	0 12 0
					Cleaning	0 1 0
				4 9 0		4 4 0
Kakan & Marwa	1 B. G.	Grain	2 20 0	3 5 0	Manuring	1 0 0
					Seed	0 2 0
					Weeding	0 12 0
					Watching	0 4 0
					Cutting	0 8 0
					Cleaning	0 4 0
				3 5 0		2 14 0
Indigo	1 B. M.	Plant	70 0 0	14 0 0	Seed	1 0 0
					Weeding	0 9 0
					Cutting	0 15 0
				14 0 0		2 8 0
Rice	1 Bigha.	Grain	14 0 0	14 0 0	Seed	0 5 0
					Weeding	0 12 0
					Cutting	0 12 0
					Cleaning	0 12 0
				14 0 0		2 9 0
				35 14 6		12 3 0

SPRING CROPS.

			M. s. ct.	Rs. a. p.		
Barley after Makka	2 Bighas.	Grain	10 20 0	11 5 0	Seed	1 9 6
		Mustard	0 20 0	2 0 0	Weeding	0 12 0
		Fodder	13 0 0	3 4 0	Watching	0 4 0
					Cutting	1 4 0
					Cleaning	0 12 0
				16 9 0		4 9 0
Bejhar after Indigo and Rice	2 Bighas.	Grain (at 35)	10 0 0	11 6 0	Seed	1 9 0
		Mustard	0 10 0	1 0 0	Weeding	0 15 6
		Fodder	12 10 0	3 2 0	Cutting	1 8 0
					Thrashing	1 0 0
				15 8 0		5 1 0
Potatoes	5 Bighas.	Tuber	12 0 0	12 0 0	Manuring	0 4 0
					Seed	1 0 0
					Earthing	0 9 0
					Digging	1 8 0
				12 0 0		3 5 0
Opium	5 Bighas.	Drug	3 20 0	11 4 0	Manuring	0 4 0
		Heads	0 10 0	0 10 0	Seed	1 0 0
					Weeding	0 8 0
					Scraping Drug	1 3 0
				11 14 0		2 6 0
				35 15 9		15 5 0

BEHARI LALL.—Do. FUSLI.

Crops.	Area.	Produce. Quantity.	m. s. ct.	Price. Rs. a. p.	Expenses.	
Tobacco	10 Bighas	Leaf	3 0 0	15 0 0	Manuring	0 1 0
					Seed	0 2 0
					Weeding	0 12 0
					Cutting	0 8 0
					Preparing	1 8 0
Followed by				15 0 0		3 7 0
Gharjas	10 Bighas	Gharjas	2 0 0	15 0 0	Manuring	0 8 0
					Seed	0 10 0
					Weeding	0 13 6
					Digging	0 8 6
				15 0 0		2 7 6
Total Produce.	Autumn Crops.		118 9 6	Cost as above	Khalf	41 15 6
	Spring Crops		193 14 0		Rabe	43 13 6
			311 7 6			85 13 6
				Add	Fodder	25 0 0
					Our hand	30 0 0
					Tools	5 0 0
					Rent	62 8 0
						203 5 0
Cost of Irrg	208 5 0	....	208 5 0			
Plush	18 13 10	Lift	12 8 7		Well	209 5 0
Labour	3 4 6	Labour	14 15 3			26 6 6
	230 7 4		235-2-10			234 11 6
Total profits	81 0 0		76 4 8			76 12 0

This is the best and most carefully worked out.

AHSAN ILAHI.—MISCELLANEOUS CROPS.

			m. s. ct.	Rs. a. p.		
Cane	1 Bigha	Sugar	7 0 0	28 0 0	Seed 2,100 @ 200	3 0 0
					Canal, 30 men	3 10 0
					Canal Rate	2 1 4
					Weeding, 45	3 12 0
					Pressing	8 0 0
					Manuring	1 8 0
				28 0 0		22 1 9
Opium	10 Bighas.	Opium	0 4 0	18 0 0	Seed	0 1 0
		Heads	0 20 0	1 4 0	Well, 27 men	2 8 6
					Weeding, 16	1 8 0
					Cutting, 40	5 0 0
					Manuring	0 8 0
				19 4 0		9 9 6
Potatoes	10 Bighas		35 0 0	35 0 0	m. s. Seed 2-10	9 0 0
					Well, 48 men	4 8 0
					Weeding and earthing	2 13 0
					Digging	0 4 0
					Manure carriage	0 8 0
				35 0 0		17 1 0
Tobacco	10 Bighas		2 0 0	11 4 0	Seed	1 0 0
					Well, 23 men	2 1 8
					Weeding, 10	0 15 0
					Cutting and preparing	0 12 0
				11 4 0		4 12 8
				94 8 0		53 2 6
					Profit	39 15 6

HET RAM.—AUTUMN CROPS.

			m. s. ct.	Rs. a. p.		
Cane	10 Bighas	Sugar	1 0 0	16 0 0	Seed	2 0 0
					Well Irrigation	0 13 6
					Weeding, 20	1 14 0
					Manuring	1 0 0
				16 0 0		5 11 6
Indigo	10 Bighas	Seed	2 0 0	20 0 0	Seed	0 10 0
					Well Irrigation	0 7 6
					Weeding and cutting	0 12 0
				20 0 0		1 13 6
Jowar	7-10	Grain Uncl.	10 20 0	50 15 0	Seed	1 0 0
					Weeding and cutting	4 2 6
		Uncl.	8 20 0	9 6 0	Cutting Arhar	2 12 0
		Til	3 0 0	15 0 0		
		Arhar	15 0 0	45 0 0		
				120 5 0		8 0 6
Cotton	1 Bigha	Uncleaned cotton	2 0 0	10 0 0	Seed	0 1 0
					Weeding, &c.	0 6 0
						0 7 0
					Rent	62 8 0
					Fodder	30 0 0
					Tools	6 12 0
				100 5 0		115 9 6
					Profit	30 12 6

BILHOUR.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ct.		Rs. a. p.			
Jowar	5 Har	Grain	28 0 0	15 0 0	Seed	1 4 8	
		Fodder	22 0 0	9 0 0	Cutting, 15 men	3 0 0	
					Weeding, 50.	4 11 0	
					Cleaning, 8.	0 12 0	
				29 0 0		8 11 0	
Bajra	2 Bighas	Grain	10 0 0	12 8 0	Seed	0 8 0	
		Fodder	....	2 0 0	Cutting, 10 men	1 4 0	
					Weeding, 20.	1 14 0	
					Cleaning, 6.	0 9 0	
				14 8 0		4 3 0	
Cotton	1 B. M.	Uncleaned	3 0 0	15 0 0	Seed	0 4 0	
					Weeding, 39 men	3 0 0	
					Picking, 32.	4 0 0	
					Manuring	2 0 0	
				15 0 0		9 4 0	
Indigo	1 B. Har.	Seed	1 20 0	12 0 0	Seed	1 0 0	
					Canal rate	0 15 0	
					Labour	2 4 0	
					Weeding, 13 men	1 3 8	
					Cutting, 10.	1 4 0	
				12 0 0		6 10 6	
Rice	1 Bigha	Rice	16 0 0	16 0 0	Seed, 6 seers	0 6 0	
					Canal rate	0 15 0	
					Labour	0 8 0	
					Cutting, 7 men	0 14 0	
					Weeding, 15.	1 2 0	
					Cleaning, 6.	0 0 0	
				16 0 0		4 6 0	
				81 8 0		33 2 0	
					Profit	48 5 8	

SPRING CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ct.		Rs. a. p.			
Wheat	1 Goonta	Grain	15 0 0	25 0 0	Seed 1-10	2 8 0	
		Fodder	35 0 0	6 4 0	Well Irr. 45 men	5 10 0	
					Cutting, 20	2 8 0	
					Weeding, 16	1 6 0	
					Manuring	2 0 0	
				31 4 0		14 2 0	
Barley	1½ Goonta	Grain	21 0 0	20 0 0	Seed 1-35	2 5 0	
	1½ Har	Fodder	36 0 0	9 0 0	Canal rate	1 6 6	
					Labour	3 8 0	
					Cutting, 32 men	2 0 0	
					Cleaning, 16	1 8 0	
					Manuring	1 0 0	
				35 0 0		11 11 6	
Bejhar	2 Bighas	Fodder	20 0 0	10 0 0	Seed	1 8 0	
			24 0 0	6 0 0	Canal rate	1 4 0	
					Labour, 18 men	2 4 0	
					Cutting, 20.	2 8 0	
					Cleaning, 10	0 12 0	
				25 0 0		8 7 0	
Gram	1½ Har	Grain	12 0 0	16 8 0	Seed	1 0 0	
		Fodder	15 0 0	3 12 0	Cutting, 12 men	1 8 0	
					Cleaning	0 15 0	
				20 4 0		3 7 0	
Opium	4 Bighas	Drug	32 0 0	11 4 0	Seed	1 0 0	
		Seeds	0 10 0	0 10 0	Well Irr.	0 13 6	
					Collecting	1 8 0	
					Weeding	0 9 0	
				11 14 0		3 14 6	
				122 6 8		41 10 0	
					Profit	81 12 0	

ASADALI.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ct.		Rs. a. p.			
Indian corn	2 Goonta	Grain	14 0 0	17 8 0	Seed 4 seers	0 4 0	
		Fodder	30 bdls.	2 0 0	Weeding	4 8 0	
					Watching	1 0 0	
				19 8 0		5 12 0	
Indigo	2 B. M	Plants	10 0 0	20 0 0	Seed 6 seers	0 10 0	
	24 B. B.	Seeds	1 0 0	40 0 0	Weeding, 40 men	8 12 0	
					Canal	3 10 0	
					Cutting	1 14 0	
				60 0 0		14 14 0	
Cane	10 B. M.	Sugar	3 20 0	10 8 0	Seed	1 0 0	
		Castor oil seed	0 20 0	1 14 0	Weeding	2 4 0	
		Fodder	...	1 0 0	Canal	1 0 0	
		Castor stalks	...	1 0 0	Share of Press	1 0 0	
				14 6 0		5 13 0	
Cotton	10 B. M.	Cleaned Cotton	1 0 0	5 0 0	Seed	0 0 0	
		Arhar	2 0 0	2 0 0	Arhar D.	0 8 0	
		Chaff	1 2 0	0 6 0	Weeding	2 13 0	
		Stalks	....	0 15 0			
				8 5 0		3 0 0	
Jowar	3 B. Har.	Grain	0 0 0	16 0 0	Seed 1	0 4 6	
		Arhar D.	6 0 0	6 0 0	Arhar 3	0 1 8	
		Urd D.	0 30 0	2 0 0	Urd	0 8 0	
		Fodder Jwar	150 bdls.	10 0 0	Weeding, 10	3 12 0	
		Do. Arhar	0 20 0	1 2 0	men	1 0 0	
		Do. Urd	1 0 0	0 4 0	Watching	1 2 0	
		Stalks	120 bdls.	5 5 0	Cutting	0 7 0	
				40 0 0		33 0 0	
				112 12 0			

SPRING CROPS.

Crops.	Area.	Produce. Quantity.		Produce. Price.		Expenses.	
		m. s. ct.		Rs. a. p.			
Barley	2 G. Dief.	Grain	40 0 0	28 14 0	Seed	6 2 0	
	6 Har.	Mustard	2 20 0	10 0 0	Sowing	0 12 0	
		Chaff	67 0 0	14 0 0	Well Irr., 11 men	0 14 0	
					Irrigation	8 7 0	
					Cutting	5 15 0	
				83 3 0		20 12 0	
Wheat	1 Goonta	Grain	21 0 0	36 9 0	Seed	4 0 0	
	1 Maughu	Mustard	1 15 0	5 8 0	Sowing	0 6 0	
	2 Har.	Chaff	39 0 0	7 8 0	Well Irrg.	1 4 0	
					Flush Irrg.	2 13 0	
					Cutting	3 4 6	
				51 9 0		11 14 6	
Bejhar	2 Di 4	Grain	8 0 0	10 0 0	Seed	1 8 0	
		Chaff	10 0 0	2 8 0	Sowing	0 2 0	
					Weeding sips	1 11 0	
					Flush canal	2 15 0	
					Cutting	1 6 6	
				12 8 0		7 11 6	
					Digging Well	1 0 0	
					Rent	82 8 0	
					One bullock	36 0 0	
					Cost of cattle	8 0 0	
					Food of Do	40 0 0	
					Well Irrg.	7 2 0	
					Carpenter	7 0 0	
						157 10 0	
				147 4 0		197 7 6	
			Total	290 2 0	Total cost	290 12 0	
					Profit	50 9 0	

DERAPUR.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	Produce. Price.	Expenses	
		m. s. ch.	Rs. a. p.		
Jowar	1½ Bighas.	Jowar	21 0 0	30 0 0	Ploughing	1 2 0
	1½ Manjhas	Arhar	7 10 0	7 4 0	Seed of sorts	0 10 6
	5 Har.	Urd	2 10 0	1 8 0	Weeding	5 10 0
		Hemp	....	0 6 0	Cutting	2 5 0
		Beans	...	0 4 0	Thrashing, &c	1 13 6
		Massa	...	1 0 0		
				45 8 0		11 8 6
Bajra	1 Har.	Bajra	16 0 0	20 0 0	Ploughing	1 8 0
		Mung	2 0 0	4 0 0	Seed of sorts	0 6 6
					4 Weedings, 12 men	1 8 0
					Watching	2 0 0
					Cutting	3 0 0
				24 0 0		11 6 6
Cotton	1¼ Manjhas	Uncleaned Cotton	1 0 0	22 0 0	Manuring	1 11 0
	1 Gunta	Arhar	7 20 0	7 0 0	Ploughing	0 9 0
		Castor oil	2 10 0	4 8 0	Seed	0 11 0
		Urd	2 10 0	1 8 0	Weeding	0 0 0
		Til	0 22 0	2 4 0	Picking	2 8 0
		Hemp	0 8 0	0 14 0	Cutting, &c.	2 0 0
				41 10 0		16 13 0
Rice	1 Gunta	Rice @ m. per bigha	...	6 0 0	Manuring	0 12 0
					Ploughing	0 6 0
					Weeding	3 0 0
					Seed	0 5 0
					Irrg. Lift	0 15 0
					Labour	2 8 0
					Reaping	1 0 0
				6 0 0		9 4 0
				115 0 0		49 0 0
					Profit	66 0 0

HET RAM.

SPRING CROPS.

			m. s. ch.	Rs. a. p.		
Wheat	2 B. G.	Grain	47 @ 20	72 0 0	Seed 3.5 gr. 19	6 0 0
	2 B. M.	Fodder	50 0 0	10 0 0	2) Well, 45 men	4 3 6
	1 B. H.	Mustard	2 11 0	8 0 0	2) Canal, 35	3 4 6
					Canal rate	2 7 0
					Weeding, 20 men	1 14 0
					Manure	1 14 0
				90 14 0		20 4 0
Barley	½ B. M.	Grain	13 @ ...	19 2 0	Seed	1 4 0
	½ Har.	Fodder	60 0 0	9 3 0	1 Well, 18 men	1 11 0
		Mustard	1 28 0	6 13 0	1 Canal, 12 men	1 2 0
					Canal rate	0 15 0
					Weeding and cutting	2 4 0
				65 2 0		10 4 0
				156 5 0		30 8 0
				322 0 0		115 9 6
					Profit	146 1 6

NASIBULLAH KHAN.

SPRING CROPS.

			m. s. ch.	Rs. a. p.		
Wheat	28 Isantas	Grain	14 2 0 @ 25	60 0 7	Seed 25 @ 20	5 2 0
	20 Manjha	Mustard	0 28 0	2 13 7	2 Well, 36 men	3 6 0
		Fodder	52 0 0	10 0 0	2 Canal, 22	2 1 0
					Canal rate	2 1 0
					Weeding, 16	1 8 0
					Manuring	0 4 6
				82 13 8		14 6 6
Barley	½ Har.	Grain	50 20 0 @ 37	54 0 0	Seed	7 3 0
		Mustard	2 16 0	9 7 0	2 Well, 24 men	2 4 0
		Fodder	59 0 0	13 4 0	2 Canal, 30	2 13 0
					Rate	1 14 0
					Weeding, 28 men	2 10 0
				77 1 0		16 12 6
				160 2 8		31 5 0
				128 10 7		154 1 0
				288 12 8		185 7 0
					Profit	103 5 0

NASIBULLAH KHAN.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	Produce. Price.	Expenses.		Profits.
		m. s. c.	Rs. a. p.			
Cane	1 Big. G.	Sugar	4 20 0	18 0 0	Seed	2 0 0
					Well 1 bigha.	1 6 6
					Canal 1 bigha.	0 12 6
					Canal rate	1 15 0
					Weeding, 20.	1 14 0
					Manuring	0 1 6
			18 0 0			8 1 0	9 15 0
Indigo	¾ Har.	Seed	1 0 0	40 0 0	Seed	1 4 0
					1 Well, 12 men.	1 2 0
					1 Canal labour.	1 8 0
					Canal rate	0 15 0
					Weeding, 16.	1 6 0
			40 0 0			5 15 0	34 1 0
Jowar	1 Bigha.	Jowar	6 20 0	13 9 7	Seed	0 10 0
		Urd	2 0 0	5 0 0	Weeding	1 6 0
		Til	....	3 5 0		
		Arhar	16 0 0	16 12 0		
				38 10 7		2 2 0	36 7 10
Cotton	2 B. Manjha	Uncleaned Cotton	1 0 0	20 0 0	Seed	0 5 3
		Arhar	12 0 0	12 0 0	Weeding	2 4 0
				32 0 0		2 9 3	29 6 9
					Tools	7 0 0
					Cattle	6 0 0
					2 Labourers @ 2-8	60 0 0
					Rent	62 8 0
			128 10 7			154 4 0

AHSAN ILAHI.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	Produce. Price.	Expenses.	
		m. s. ch.	Rs. a. p.		
Jowar, &c.	5 Bighas.	Grain 29 0 0	26 10 8	Seed @ 9 seers.	1 8 0
		Fodder 54 0 0	9 0 0	50 men weeding	4 11 0
				25 men reaping	2 5 6
				16 men thrashing	1 8 0
			35 10 8		10 0 6
Bajra	2 Bighas.	Grain 6 20 0	8 0 0	Seed	0 1 0
		Fodder 24 0 0	2 0 0	Weeding, 10 men	0 15 0
				Cutting, 10 men	0 15 0
				Thrashing, 8	0 12 0
			10 0 0		2 11 0
Cotton	1½ Bighas.	Uncleaned 6 0 0	24 0 0	Seed	0 5 0
				Weeding, 45	4 3 6
				Manure	1 8 0
			24 0 0		5 14 0
Indigo	1 Bigha.	Plant 75 0 0	15 0 0	Seed	0 4 0
				Canal and labour	0 12 0
				Canal rate	0 15 0
				Weeding, 20 men	1 14 0
				Cutting, 12 men	1 2 0
			15 0 0		4 15 0
Dhan	1 Bigha.	Rice 8 0 0	8 0 0	Seed	0 2 0
				Weeding, 10 men	0 15 0
				Cutting, 4 men	0 4 0
				Cleaning, 2 men	0 2 0
			8 0 0		1 9 0
Makka	2 Bighas.	Maize 15 0 0	15 0 0	Seed	0 8 0
				Weeding, 37 men	3 7 0
				Cutting and cleaning	0 8 0
				Manuring	3 0 0
			15 0 0		6 7 6
		Total	107 10 8		31 0 6
				Profit	76 9 2

AHSAN ILAHI.

SPRING CROPS.

Crops.	Area.	Produce. Quantity.	Produce. Price.	Expenses.
		M. s. c.	Rs. a. p.	
Wheat	2 Bighas	Grain 14 0 0 Fodder 25 0 0	21 8 0 6 4 0	Seed @ 24 2 0 0 Well, 48 men 4 8 0 Cutting, 34 men 3 0 0 Cleaning, 10 men 0 15 0 Carriage of manure 1 8 0
			27 12 0	11 15 0
Barley	2 Bighas	Grain 30 0 0 Fodder 45 0 0	30 0 0 11 4 0	Seed @ 28 3 0 0 Well, 20 men 2 13 0 Cutting, 30 men 3 12 0 Cleaning, 15 men 1 6 6
			41 4 0	10 15 6
Gujai	1 Bigha	Grain 7 @ 20 Fodder 10 0 0	9 5 0 2 8 0	Seed 20 @ 20 1 1 6 Well, 10 men 0 13 0 Cutting, 10 men 1 4 0 Cleaning, 5 men 0 7 6 Manuring 1 0 0
			11 13 0	4 12 0
Bejhar	1 Bigha	Grain 7 0 0 Fodder 12 0 0	7 0 0 3 0 0	30 seers seed 1 0 0 Cutting, 10 men 1 4 0 Cleaning, 5 men 0 7 6
			10 0 0	2 11 6
Grain	1 Bigha	Grain 8 10 0 Fodder 10 0 0	11 0 0 2 8 0	20 seers seed 1 0 0 Cutting, 10 men 1 4 0 Cleaning, 5 men 0 7 6
			13 8 0	2 11 6
Bejhar	Do.	Grain 1 0 0 Fodder 6 22½ 0	4 0 0 1 9 4	Seed 1 0 0 Cutting 1 4 0 Cleaning 0 7 6
			5 9 4	2 11 6
			109 14 4	35 3 6
			Profit	74 11 4

GHATUMPUR.

SPRING CROPS.

Crops.	Area.	Produce. Quantity.	Produce. Price.	Expenses.
		m. s. ct.	Rs. a. p.	
Wheat Cane	2 Bighas	Wheat 10 0 0 Red Mustard 0 20 0 Black Do. 2 20 0 White Do. 0 20 0 Linseed 1 0 0 Kaum 0 20 0 Kaum seed 1 20 0	15 0 0 1 0 0 10 0 0 1 8 0 2 10 6 8 0 0 1 8 0	Seed 1m. 1 8 0 Do. 3s. 0 4 0 Do. 4s. 0 8 0 Do. 3s. 0 4 0 Do. 7½s. 0 8 0 Do. 10s. 0 8 0 Weeding, 14 men 1 1 6 Well irrigation 8 7 0 Reaping, 12 men 1 8 0
			39 10 8	14 8 6
Gujai Manjha.	2 Bighas	Gujai 10 0 0	13 0 0	Seed 1 m. 1 7 0 Well irrigation 8 7 0 Reaping 12 men 1 8 0
			13 0 0	11 0 0
Bejhar Har.	6 Beghas	Irrigated 2bs. 10 0 0 Dry 4 bigs. 20 0 0	21 13 4	Seed 3 m. 4 0 0 Reaping, 36 men 4 8 0 Canal irr. rate 1 4 0 Labour 0 3 0 Dal Rate 1 6 6 0 3 8
			21 13 4	13 7 0
				Manuring 7 0 0 Thrashing 2 13 0 Well irrigation 3 8 0 Tools 0 4 0 Rent 19 8 0
			74 8 0	48 7 0
			Profit	25 8

Rent rate much too high.

GHATUMPUR.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	Produce. Price.	Expenses.
		m. s. ct.	Rs. a. p.	
Cotton Gotan. Manjha.	2 Bighas	Cleaned Cotton 0 35 0	14 0 0	Seed 6s 0 4 0 Weeding 2 5 6
			14 0 0	2 9 6
Bajra	2 Bighas	Bajra 5 0 0	5 8 0	Seed 1½s 0 1 0 Cutting, 10 men 1 4 0 Watching 2 13 0 Weeding 1 9 0
			5 8 0	5 11 6
Jowar I Manjha. 2 Barha.	6 Bighas	Jowar 14 0 0 Arhar 5 0 0 Urd 4 0 0 Til 1 0 0 Mung 1 0 0 Hemp 0 35 0	10 0 0 5 0 0 5 0 0 4 0 0 2 0 0 1 8 0	Jowar seed 6s 0 6 0 Arhar, 15s 0 0 0 Urd, 6s 0 0 0 Til, 1s 0 1 6 Mung 1½s 0 1 0 Hemp 10s 0 4 0 Cutting, 20 men 2 8 0 Weeding 4 11 0
			28 8 0	8 12 0
Kakun Gowa	1 Bigha	Kakun, &c. 2 0 0	1 8 0	Seed 1s 0 0 6 Cutting 15 men 1 14 0
				1 14 6
1 Har. Rice	1 Bigha	Rice 4 0 0	4 0 0	Seed 1½s 0 8 0
1 Har. Maize	1 Bigha	Maize 3 0 0	3 0 0	Seed 2s 0 2 0
Kodon.	....	.... 1 0 0	1 0 0	Seed 1s 0 5 3 Manure 3 0 0 Rent 17 4 0
			47 5 0	20 13 9
			Profit	27 7 3

BELHOUR.

MISCELLANEOUS.

Crops.	Area.	Produce. Quantity.	Produce. Price	Expenses.
		m. s. ct.	Rs. a. p.	
Maize	2 Bighas	Grain 15 0 0 Fodder	15 0 0 2 0 0	Seed Cutting Weeding, 32 Cleaning, 5 Manurang
			17 0 0	5 7 6
Kakan, &c.	1 Bigha	Grain 5 0 0	4 0 0	Seed Weeding Cutting
			4 0 0	1 5 0
Cane	1 Bigha	Sugar 8 0 0 Castor oil	32 0 0 2 8 0	Seed Canal rate Weeding, 21 Pressing Mill, 2 men for 1 month Labour Manure Labour, 20
			34 8 0	19 1 4
Potatoes	6 Bighas	Tubers 18 0 0	20 8 0	Seed Well irr., 13 Earthing, 6 Digging, 3 Manuring
			20 8 0	3 9 0
Tobacco	10 Bighas	3 0 0	15 0 0	Seed Well irr., 18 Cutting, &c. Manure
			15 0 0	7 8 0
			91 0 0	Tools Labourers Cattle food Rent
				159 6 10
		Grand Total 402	6	Total cost 279 10 6
				Profit 151 6 6

AKBARPUR.

AUTUMN CROPS.

Crops.	Area.	Produce. Quantity.	m. s. ct.	Price. Rs. a. p.	Expenses.	
Cotton	26 Manjhas	Uncleaned cotton	4 0 0	20 0 0	Seeds	0 4 0
		Castor oil seed	1 0 0	2 8 0	Weeding 3 times, 6 men.	4 8 0
		Arhar	6 0 0	7 0 0	Pulling	2 0 0
		Fodder arhar	32 0 0	6 14 0		
		Stalks arhar, Castor oil	....	11 0 0		
				47 6 0		6 12 0
Jowar	6 Bighas	Grain	30 @ 22	54 8 0	Seed	2 0 0
		Urd	12 0 0	24 0 0	Weeding	4 8 0
		Til	3 0 0	12 0 0	Watching	3 0 0
		Arhar	24 0 0	28 0 0	Cutting	6 0 0
		Fodder urd	....	6 0 0		
		Karbi	....	12 0 0		
				33 8 0		15 8 0
Bajra	2 Bighas	Grain	10 0 0	20 0 0	Seed	In Jowar
		Mung	2 @ 20	4 0 0	Weeding	1 8 0
		Til	0 20 0	0 12 0	Cutting	2 0 0
		Arhar	6 0 0	6 0 0		
		Mung fodder	....	1 0 0		
		Karbi	....	2 0 0		
				33 12 0		3 8 0
Indian corn	2 Bighas	Grain	12 0 0	16 0 0	Weeding	1 0 0
						26 0 0
				235 10 0		58 12 0
					Profit	178 14 0

SPRING CROPS.

			m. s. ct.	Rs. a. p.		
Wheat	2 Bgs. G. 2 Bgs. M.	Grain	32 @ 22½	57 0 0	Seed	7 2 0
		Mustard	2 0 0	5 0 0	Weeding	4 0 0
		Fodder	90 0 0	16 0 0	Cutting	4 0 0
				78 0 0		16 2 0
Bejhar	46 Har G. Det.	Grain	32 @ 28	45 14 6	Seed	5 0 0
		Mustard	2 20 0	11 7 6	Weeding	5 0 0
		Fodder	75 0 0	15 0 0	Cutting	5 0 0
				72 6 0		15 0 0
Grain	1 Bigha	Grain	0 @ 22	11 0 0	Seed	1 0 0
		Mustard	0 5 0	0 6 0	Weeding	1 0 0
		Fodder	0 0 0	1 0 0	Cutting	1 0 0
				12 5 0		3 0 0
				Lift	Irrigation, &c. Del. 26 Labour	6 15 0
					Rate	1 14 0
				Flush	Tur. 4 Rate	5 10 0
					Labour	1 2 0
					2 Labourers 1 year	72 0 0
					1 for 3 thrashing	0 0 0
					Tools	11 13 0
				162 11 0	Bullocks' food	36 0 0
					Rent	62 0 0
		Total	profit	303 5 0	Total Miscellaneous	206 0 0
					Total	355 2 0
					Profit	86 7 0

THE COTTON GINS AT BROACH:

THE PRINCIPLES ON WHICH THEY ARE CONSTRUCTED.

To the Editor of the Times of India.

SIR,—These trials of gins are still continued day by day, as incessantly as ever, with almost uniform results as regards "yield" for each particular gin; but as to quality, that is a question for spinners to settle. Iron masters know what "driving" their furnaces means; but increase of quantity implies always decrease of quality, unless there is some great improvement on the old plan of working. There is one peculiarity in all the gins; they are all nearly alike in principle, that is, they are all more or less constructed upon the principle of an inclined plane, and yet to a casual observer they do not in appearance seem to resemble each other so much. Your own correspondent said one of them resembled an Archimedian screw, and at first sight Dobson's looks exactly like a screw; but the thread is not continuous—only a number of discs are placed at an angle with the shaft to which they are fixed, but their action is exactly that of an inclined plane; and as the Archimedian screw is really an inclined plane, your correspondent was not so far wrong. Jones's gin has the inclined planes set on the shaft at alternating angles—right and left—but the principle of his and Dobson's is precisely the same; they both press the seed away from the fibre, and do not act as "beaters," like a thrashing machine, as, I believe, his first gin did. It might be difficult for a jury to decide whether the two gins were not infringements of each other's patent; but then the "mode" of doing the thing is different, though the principle is the same. Sugdens's gin is on the regular screw propeller principle, with two long and two short blades set at alternate angles. The blades being few, the working is slow, but the principle is not bad and is capable of great improvement. Henderson's Macarthy gin has also the inclined plane, but with a different action. Without plans, however, it may be difficult, and it would not be of much use giving a minute description of all the gins, which can be of little interest to outsiders.

The Dobson's gin is a well-made machine, and its mechanism is nearly faultless. Jones's has evidently been made under difficulties, but is very creditable for all that; to the eye, however, it looks more like the work of a very clever amateur than that of a skilled mechanician. Sugdens's is also a good gin as far as regards workmanship and strength; and as it certainly has not a suspicion about injuring the fibre, it is well worthy of attention, and may still be improved as to speed. The improved Macarthy gin may still hold its own, if it is found the best for continuous working without injury to staple; for if the fast gins injure the staple, or get highly heated with continuous work, then their adoption will never become general; for it may be like brick making by machinery. A brick machine moulds plenty of bricks, but generally not of good quality, and after all the moulding of bricks is but a very small proportion of the entire cost of making them, and there is little or no saving. So the ginning of cotton is but a small (very small) proportion of the expense of the complete manipulation of the cotton from the picking to the weaving. It may be found in the end that all this fuss about gins is "much ado about nothing," and I'm inclined to believe that the slower gins will still hold their own, though gradual improvements must creep in from time to time.

To-day is the grand continuous trial day, when the patentees are to be kept away, and the natives allowed a fair chance of doing the best they can with each separate gin. All previous trials have been with small quantities and for short periods, seldom exceeding an hour. Your own correspondent will doubtless send you the final results.

Broach, May 27. J. SMITH.

MILK ADULTERATION.

WE extract another article on milk adulteration, from the *Indian Observer*, which more than bears out what we wrote last week.

Calcutta, or rather Chowringhee, was a few weeks back agitated upon the subject of milk. Cholera was believed to lurk in the cream-jug. Death stared you in the face out of custard puddings. The agitations subsided, as Calcutta agitations always do, within the usual nine days. One or two energetic persons insisted on making the *goeala* bring his cow to the house, and are now happy in the belief that their milk is undiluted, forgetting to test the emptiness of the milkman's *lotah* before the lacteal streams descend therein. We are sorry to have to draw attention to a subject which may seem worn out, but the following description of one of the principal dairies in the place, as given by the Cattle Plague Commission, is so very disagreeable that it is a matter of public duty to make it known. The dairies consist of a number of huts rather irregularly placed among several pools of dirty greenish-brown water called tanks. Some of these tanks are covered thickly with vegetation, which has to be skimmed when any one goes to draw water to bathe. The water is actually thick with filth. The population of the surrounding huts bathe, wash clothes, and clean grain in these tanks, from which all the water for domestic purposes and also for *diluting the milk* is regularly drawn. A dairy hut is a long unpartitioned house with walls of bamboo matting, sometimes daubed with cowdung and clay, and having a tiled roof. The general size is 10 yards long and 4 yards wide. The ridge-pole is not more than 8 feet from the ground. One man has ninety cows in four of these sheds. Down the centre runs a single narrow drain about two inches wide and one foot deep. On each side of this the floor is planked, and outside the planks flagged. On the planks the cattle stand in two rows with their hind feet close to the drain. There are no separate stalls. The cows are packed so close that they touch. The whole ventilation is one door at the side, and a small window at either end. Outside is a verandah in which straw is piled, and where cattle suffering from *rinderpest* are placed for segregation. The end windows, though meant for ventilation, are generally closed, and a purdah hangs in the doorway within which a smouldering dung fire constantly burns to keep flies off the cattle. The centre drain is open at each end, and falls into cesspools which vary in size from 6 to 20

feet in diameter, and are generally 10 feet deep. Their contents are never restored as a whole. The solid manure is made up into cakes as required for fuel—and the putrid liquid stuff is surreptitiously turned into the Municipal drains—if any of them are conveniently near. Otherwise it is allowed to *fester* till a Municipal prosecution compels the owner to fill up the pool. This is done by throwing earth and litter on the top. Vegetation follows and an artificial quagmire is produced. So numerous are these that strangers to the neighbourhood, to avoid accident require a guide. Into one pool the Commission threw a match, and instantly the surface was covered with a flame. The cows are fed on oil cake, which accounts for the oily taste of Calcutta milk. Is it to be wondered at that cattle kept under these insanitary conditions are constantly ailing and frequently decimated by *rinderpest?* Is it to be wondered that cholera abounds in a town where *bustees* of this description are to be found even near the principal roads and streets? Can anything excuse the apathy which year after year allows such nuisances to be and flourish? Every European and native Justice ought to be compelled minutely to inspect the *bustees* under the conduct of the Health Officer. On the occasion of this inspection, they should be allowed no cheroots, no *pan*, no eau-de-cologne—and no one should be permitted to hold a pocket-handkerchief to his nose. At the close of the ordeal, each Justice might be allowed half a seer of carefully diluted milk by way of refreshment at the expense of the rate-payers. The visitation to be monthly, till the *bustees* are cleansed and reformed. What harmonious and vigorous action we should see if this were only tried!—*South of India Observer.*

COCOANUT OIL IN CASES OF CONSUMPTION.

That cocoanut oil is a good specific for consumption, is a fact which is not perhaps generally known. The recent enquires in the properties of the oil have shown that it may be administered, with advantage, to phthisical patients as an adjunct, if not has a substitute for codliver oil. The following observations regarding it may be of interest to our readers —"It is found that during the administration of codliver to phthisical patients, their blood grows richer in red corpuscles. This fact has been observed by many eminent men of the medical profession, all of whom agree that such is the case. The use of almond oil and olive oil have not however resulted so favourably, but from cocoanut oil, results obtained are almost as decided as from the oil of the liver of the cod, and it is generally believed that it may prove a useful adjunct or even a substitute The oil to be employed must be a pure cocoalene, obtained by pressure from crude cocoanut oil, as expressed in Ceylon and the Malabar Coast, and refined by being treated with an alkali and repeatedly washed with distilled water. This oil burns with a faint blue flame, showing a comparatively small proportion of carbon and is undrying."

The results from the administration of codliver oil and cocoanut oil, to persons affected with consumption, tend to show that the use of the latter in cases of phthisis, should be encouraged. In the third state of the disease, after the use of cocoanut oil, the blood has been found to be richer in red corpuscles than after the use of codliver oil.

It is remarkable that in Malabar, the natives are less subject to phthisis than in many other places. And this may be attributed to the use of cocoanut oil, which is almost the only oil used for cooking and other purposes amongst them The statistics furnished by the medical institutions of the district indicate that the rates of those who suffer from consumption to the population is not even 1 to 1,000, and this fact must tell greatly in favour of cocoanut oil as a remedy for that disease. It is worth therefore testing the properties of the oil still more searchingly, and we trust that the attention of medical men will be drawn to the matter. The Madras Government, lately endeavoured—we believe, to find a substitute for the costly codliver oil for their hospitals; and now that cocoanut oil has been reported to be good for consumptive patients, it is not likely, let us think, that its value will remain unrecognised. The use of cocoanut oil in Government hospitals, instead of codliver oil, may not be at once urged; but if it be sufficiently established that the one is a good substitute for the other, we suppose that the Government would eventually see that the oil is generally used.—*Cochin Argus.*

THE FLORA AND FAUNA OF THE ANDAMAN ISLANDS.

We have received a selection of despatches and enclosures to and from the Secretary of State for India in Council, on Indian Forests, showing the measures which have been adopted, and the operations going on in the several Presidencies and Lieutenant-Governorships. There is one paper of peculiar interest, a Report by Mr. S. Kurz, on the vegetation of the Andamans, and giving among other things the general botanical aspect of the islands from the sea, and the geological features of South Andaman and the adjacent islands. The whole of South Andaman and Rutland is hilly, traversed by narrow and steep ridges, of no great height, and encircled by a dangerous reef composed chiefly of *Cryophyllia, Madrepora, Porites, Meandrina,* and other reef-forming corals. Between high and low watermark there exists in some places a swampy zone formed by a large number of yellow and high-coloured carnous sponges covering the coral reefs, and exhaling a disagreeable smell. The principal ranges run from south by west to north by east, somewhat in the direction of the lines of "out-crops" of the different strata. They are most developed along the eastern coast, where they attain sometimes a height of 1,200 to 1,300 feet, sending out numerous spurs towards the sea. Ford Peak on Rutland Island exceeds 2,000 feet in elevation, and the Saddle Mountain in North Andaman, is rather more than 3,000 feet high. Towards the western coast they gradually become lower, and nowhere on that coast are higher ridges observed than from 200 to 300 feet elevation, bounding fertile valleys of comparatively large size. Some isolated hills, however, may be seen further inland, and these, Mr. Kurz estimates to be between 5 and 600 feet high. The entire surface appears to be intersected by numerous steep ravines, which open out in all directions, and are obstacles to travelling in the interior of the Island The hills and ridges slope precipitously along the sides towards the sea, usually at an angle about 45°, but often more.

To a traveller sailing along the eastern coast of South Andaman, the island seems like a series of low hills, in no case higher than 1,200 feet, and covered with dense lofty forests All the trees show straight stems with a mean height of 100 feet, and are often entirely covered by climbing plants, which hang from the summits of the trees in gigantic festoons Amongst these lianes *Dendrobia Pangkorensis, Entada Pursaetha, Calamus* and *Dendrobia secundariorum* may be recognized The straight growth of trees disappears, however, south of St. Corbyn's Cove, and along the western coasts, where there is a more stunted vegetation, the mean height of the vegetation being about 80 feet Along the western coasts the trees show a tendency to bend in conformity with the direction of the south-west monsoon Long tracts may be observed with leaf-shedding trees, and these deprive the landscape during the dry season of that tropical verdure which prevails during the rain. Mangrove swamps in which *Rhizophora* and *Ceriops* with their green glossy foliage, distinguish themselves fringe all the little bays and straits. *Phoenix paludosa* is a characteristic feature along Middle Straits, *Barringtonia* and *Excoecaria Agallocha* are easily recognized by their red decaying leaves during June and July, and *Lagerstroemia Pierocarpus* by their rich lilac or yellow blossoms *Mussaenda*, with its snow-white calyx segment, is frequently seen A large *Cycas*, with broad leaves, appears everywhere along the sandy shores, and resembles in habit small plantain trees In some spots, arborescent *Euphorbiaceæ* occur and present strange appearance *Sonneratia* and a *Cycas* of considerable height give a strange character to the whole vegetation

The real vegetation of the shores does not extend generally further inland than half a mile, though some exceptions may be found in the numerous creeks which are nearly all bordered by a sandy beach of greater or less extent, and a fringe of mangrove jungles The vegetation of the shores is intersected by coast vegetation, wherever the hills slope steeply into the sea Mr. Kurz tells that the species of mangrove which form the swamps at Mangrove Bay, Flat shallows and along Middle Straits, are almost exclusively at one place *Bruguiera gymnorhiza* and at another *Rhizophora mucronata*, conjoined with *Ceriops Candolleana*

The last three kinds advance furthest into the sea, and appear as a low dense hedge, fringing the shores with vivid green leaves, and are often accompanied by the glutinous looking *Avicennia officinalis* and *apetala* bordering the mangrove swamp (and along a great part of these islands directly bordering the sea, where mangrove do not grow owing to the steepness of the shores) a small zone of beach vegetation appears This is confined to places where loose sand, rubbish, and corals have been washed up by the sea forming small beaches along the coast The principal vegetable forms in these regions are *Thespesia populnea, Hibiscus tiliaceus, Pongamia glabra, Erythrina Indica, Guettarda speciosa, Heritiera littoralis, Dalbergia sp., Jambosa,* and *Pandanus verus*—found in abundance, *Cycas Rumphii* occasionally, and several white-flowered species of *Pavetta, Ixora, Cynometra bijuga, peltophorum ferrugineum, Nypa fruticans*, found along the courses of the creeks. *Barringtonia speciosa, Mimusops Indica* in stunted specimens, and *Calophyllum Inophyllum*, sometimes of enormous size, are also to be seen.

The influence of the seasons upon vegetation is nowhere more marked than on the Andamans. In April and May, few plants are to be seen in flower, and the forests have generally a dried up appearance. A fortnight or so after the rains have set in, a new life begins. The formerly leafless trees appear in bright green, and a numerous pinnated-leaved trees belonging to *Sapindaceæ, Meliaceæ, Burseraceæ, Anacardiaceæ* and numerous families of a more southern vegetation, all contend in the developing of their buds. "All vegetation takes a Malayan type, and we often do not recognize again the spots which we passed during the dry season," when they were nearly barren, and the yellow clay oil, as covered only with dust The rapid change is not confined to the flora, but affects also the fauna. Frogs and toads are now croaking snakes appear more numerous, snails are plentiful on the wet stems and leaves, fire-flies, before nowhere seen, appear, though in a moderate number, giving a dusky light, and crickets loudly chirp A swarm of pests, however, accompany this delightful change, and hosts of mosquitoes, horse-flies, gnats, sand-flies, &c in company with leeches abound.

Mr. Kurz believes the whole flora of the Andamans to be a very primitive one, and that it never could have been influenced by the agency of man. Although it has been stated by several eminent botanists that the germinating power of seeds is capable of preservation for a long period in sea water, Mr. Kurz says that he rarely succeeded in obtaining a single good seed among the rubbish washed out by the sea

along the shores; and those he found were always of such species of plants that grow along the same coasts. As a strong argument against his own opinion of the over-rated importance of immigration, the writer remarks that sometimes large pieces of bamboos, measuring often 2½ feet in circumference, and belonging evidently to *Bambusa gigantea*, have been met with by him, not only along the eastern, but also along the western coasts, drifted he surmises from the direction of the sources of the Irrawaddy, north of the islands. The length of time however the wood has travelled to reach the Andamans, cannot be determined since we possess no knowledge of the nature of the preservation of bamboo in sea water.

The genera which are most richly represented on the Andamans are *Ficus*—13 sp.; *Vitis*—8 sp.; *Sterculia*, *Pavetta*, *Cordyline*, and *Cyperus*, each by 5. sp.; *Memecylon*, *Ipomœa*, *Myristica*, *Calamus*, *Asplenium* and *Pteris*, each by 4 sp. An enquiry into the causes of the different modes of immigration of the non-indigenous plants on the Andamans would, it is said, show that the whole number has been introduced by the agency of man, direct and indirect—a fact which goes to prove how small is the chance for exotic plants to cross the sea. Mr. Kurz is inclined to believe that introduction of plants by means of winds, birds, &c., is applicable only in the case of continents, and not to isolated groups of islands. The Andamanese flora, arranged according to the inhabitants of the different species, gives the following rough results:—

Marine plants	1
Mangrove and salt marshes	29
Sandy beaches	53
Forests	418
Woodless spots and cultivated lands (indigenous)	19

While on the Andamans, Mr. Kurz found that the Burmans were best acquainted with the flora of the islands, but that they were by no means equal to the Andamanese in accuracy and certainty of determination. While the Burmans were obliged continually to cut into the bark to recognize the trees, the Andamanese readily gave their names, and he could rely upon their statements, which was not the case at all with those of the Burmese. The Andamanese names of plants are far simpler and more euphonious than the Burmese ones. The aborigines commonly add the syllable "dab" to their names for trees and plants, and have often a single name for a diversity of plants belonging to the same family. Thus, for instance, they call *Pterocarpus dalbergioides*, *Albizzia Lebbek*, and *Inga* altogether "beymadah." *Filices* they designate by the name "bad mar," &c. The Burmans, however, go a little farther, and have no name for a variety of plants very different from each other; as for instance, Kamaso, which is applied to *Heritiera littoralis* and *Baccaurea sapida*; theet-ka-do, *Sterculia ornata* and *Culeela Toona*; menga, *Garcinia Mangostana* and *Elæagnus conferta*, &c., &c.

Towards the end of the report, Mr. Kurz makes a few further remarks on the fauna of the Andamans. The mammals are confined to *Cynopterus marginatus*, *Paradoxurus Andamanicus*, *Mus Andamansis* and *Sus Andamanensis*. A wild species of cat, is said by Colonel Tytler to exist, but it has never been found. Birds appear to be numerous, but are little known. Amongst 15 or 20 kinds of reptiles hitherto found on the islands, two species of toads are common during the rainy season; one of these has been introduced, the other is indigenous. Marine fishes are plentiful, but fresh water fishes are very scarce. Amongst molluscs, no fresh water shells nor any *Limacida* occur, and the few land shells are only found during the rains. At this time *Helicina Andamanica* and *Cyclophorus fulcatus* are exceedingly common on wet stems and on leaves.

Friend of India.

The Foresters' Gazette.

BOMBAY, 21st June 1872.

THE TEAK TREE.

A Parliamentary Return out by last mail, contains a Report by Mr. Dalzell, Conservator of Forests in the Bombay Presidency, on the Natural History and Biology of the Teak Tree found from the 8th degree of south latitude in Java, to the tropic of Cancer, in north latitude 23° 30′. There are no means of ascertaining what is the distribution of the teak tree in longitude, but it is not to be found further west than 72° of east longitude. As in the case of many species of plants, the "food" of the teak tree consists mainly of carbonic acid; but, unlike most trees, the teak grows best in silica. To the large secretion of silica, Mr. Dalzell attributes the durability of teak timber grown in the Bombay Presidency, as well as its unpopularity with carpenters, whose best tools are soon blunted in working it. The objection is less applicable to Moulmein teak, which is much softer, looser in texture, and contains less silica. In fact there is nearly as much difference in the grain of Moulmein teak compared with that of Bombay as there is between ordinary bone and ivory; the former weighing on an average 42 lbs., and the latter as much as 55 lbs., to the cubic foot. The difference is owing to the drier climate and the slower rate of growth in Bombay, as well as to a larger proportion of silica. It has long been a matter of controversy whether fast grown teak is inferior or superior to slow-grown teak, and the differences of opinion on this point appear to be due to the fact that those who use teak wood in large scantlings, as in ship building, are in favour of fast-grown wood, while those who work with teak in short proportions decide in favour of the slow-grown wood. The superiority or inferiority appears to depend on the purposes for which the wood is required. With a steady supply of moisture, the germination of teak seed may take place within fifteen days. Mr. Dalzell makes some practical and valuable remarks with respect to sowing and the selection of seed. He holds that teak seed should be gathered and sown as soon as it is ripe, (when the natural juices have not had time to dry up). If this rule is adhered to, germination will be all the more speedy. The seed, also, should always be taken from young and healthy trees. Teak forests are divided into high teak forests, as in the Dangs and North Canara, and scrubby teak forests, as they exist in the Konkun. Although they are the same plants, the growth is materially altered by soil, climate, and forest operations. The high teak forest is felled every 80 to 120 years; the scrub teak, is cut down every 15 years, the roots remaining in the ground and sending forth new shoots.

August is the best time for felling teak trees. If the cutting were done while the cambium is unexpended, it would render the timber liable to the attacks of insects which subsist on this fluid. There is another advantage, also, in felling at this period; the vessels of the wood are then wide and open, so that the timber is quickly seasoned, the water contained in it having a more easy means of escape. Mr. Dalzell has found teak trees growing on granite, quartzite, clay-slate, mica-slate, sandstone, laterite, and basaltic formations. The vertical range of teak is 3,000 feet from the level of the sea, but it always avoids the "upper third" of mountain ranges, at whatever height they may be, and as much as possible exposed situations.

By the natives of this country, the teak is believed, and rightly, to be the most valuable of all Indian trees; it is hardly ever affected by the violent and sudden changes of temperature which render so many Indian trees almost worthless. The teak is what may be called a social tree, growing in groups large or small. This circumstance renders it extremely valuable for trade purposes. Mr. Dalzell thinks there can be little doubt that at one time, perhaps centuries ago, the Konkun plains were a continuous forest of teak; even now, in situations where the soil is inferior and the population scanty, the remains of these extensive forests are easily seen. But as population increased, the forest gradually diminished; and now the teak is generally confined to rocky hills. Not the least remarkable feature of the teak tree is, "that it is like the Hydra's head, cut it down again and again for a century, and it will present you with ever-increasing shoots, shoots which would, under favourable circumstances, become as large as the parent tree."

Friend of India.

THE SEASONING OF TIMBER.

Reports have been made to the Madras Government, Public Works Department, by the Superintendent Engineers on the seasoning of timber. Lieutenant Colonel J. Michael, says that his experience is all in favour of seasoning timber in the log before converting into scantling. For railway sleepers and small building timber, cut in forests where the trees are small, piling them on end in a pyramid is a good one. But in the Madras Presidency the trees are larger, and could not be dealt with in that way. And as they will not float when green, he recommends that they should be seasoned in the forests before removal. In the case of most descriptions of timber he believes that the best and safest method of seasoning is to girdle the tree two years before it is wanted, and allow it to dry standing. Teak, however, he would fell green, on account of the danger to the tree from being felled in a dry state. The Conservator of Forests encloses some very good memoranda on the subject. All timbers, one enclosure states, should be seasoned in log for a long time, scantlings being almost certain to warp and crack, if cut in a green state. The general practice in England of rough-squaring also is held to be inapplicable to India. The process, it is admitted, would facilitate the seasoning, but it would also increase the risk of cracking which is prevented in a great measure by the bark being left on. It is recommended here that after the log is felled and rough-squared, it be split in two and thrown into the water to season, a process which quickens the seasoning, imparts hardness to the wood, and renders it impervious to worms. These opinions will be valuable to more than the Government.—*Friend of India.*

THE FORESTS OF INDIA.

The forests of India, which extend over an area greater in extent than the British Isles, have very recently engaged a considerable share of the attention of the Parliamentary committee upon the financial resources of that country. From the evidence given by Mr. H. Cleghorn, a practical botanist and, Mr. C. B. Phillimore, one of the officials in the Revenue Department of the India Office, may be gathered some interesting and important particulars respecting the former, present, and prospective condition of the forests. For many years, there was great neglect and numerous complaints, until the beginning of the present century, when the Court of East India Directors, for the first time, desired the Government of India to assert the royal rights which had been held by the native princes over the forests of Malabar. Again, in 1830 the want of timber was severely felt by the Indian Navy Board of Bombay, and the appointment of a conservator was then urged upon the Government. The neglect still continued, when Sir Robert Grant took up the question, and, in 1846, Dr. Gibson was appointed to that post. In Burmah, the question was first taken up earnestly in 1841, by Mr. Colvin, the Chief Commissioner in the Tenasserim Provinces, and Dr. Falconer was specially employed. At about the end of the year 1855, the Madras Government followed in the same course, and Dr. Cleghorn was called upon to organize the department there. It appears, therefore, that conservancy first commenced in Bombay, Burmah, and Madras. The permission given imprudently to persons to cut the timber in forests of the Irrawaddy, induced the Secretary of State to write a despatch to the Governor-General, calling his particular attention

to the matter, and this led to the formation of a separate department for the whole of India.

Since that time (the year 1863), all the great provinces have been placed under conservators, with deputy and assistants, and the administration has gone on improving. The staff now consists of 88 European officers, some of whom are scientific botanists, practical engineers, and surveyors, the subordinate posts being filled by natives, whom it is intended to employ in the higher grades, as soon as a school of forestry can be established for their education. This cannot be accomplished until the forests are in such order that they would present an example of what a forest should be, and there is a sufficient number of skilled people who can instruct others. At present, the Secretary of State is training young men on the Continent of Europe—in France and Germany—where they are sent for three years' tuition, before they proceed to India. The reason we have not attempted to establish a forest school of our own, arises from the fact that such an admirable training can be gained on the Continent, where the forests are upon a large scale, and the service has come to rank with the other great services of the State, such as the engineers and the artillery. Both in Italy, France, and Germany, there is a very large forest literature; and it would be highly advantageous to graft forest training upon such a school as the Royal Agricultural College at Cirencester or the Highland Society of Scotland. The persons employed in the administrative department need all the knowledge that can be acquired in botany and geology; whilst the making of roads and the tending of water-courses demands a like acquaintance with surveying and levelling. One of the circumstances which has induced the Government to look after the forests is the increased price of fuel and timber all over India. The introduction of railroads, locomotives, and steamboats has made a demand for fuel, and also for timber for the construction of the railroads. The increase of the population, and the general increase of their wants, has also led to this demand. The duties of the department consist, therefore, in the demarcation of the spaces, the felling of the timber, and the reproduction or planting according to the best method. In the reserved forests, where they have not been ill-used, the object is to place them under regular management, so that the timber can be brought to market in better condition, and a supply be always ready in rotation. At present, it is scarcely possible to state with any accuracy the extent of the forests. In the Central Provinces there are about 21,000 square miles; in Burmah about 2,400 square miles; in Assam about 4,000 square miles. When the forests have been surveyed and demarcated in the North-Western Provinces—Bombay, Madras, and the Punjab—we shall know better the whole area, although it will be difficult even then, so great and scattered are the tracts of country which they occupy. In the original surveys, the forests were included under "wastes," and unscrupulous contractors, or persons who had received permits, were enabled to cut down the trees without any regard to the number. There was no check on the licensee-holder as to the quantity of timber that he took, and he was not restricted to cutting the trees level to the ground; he cut them three or four feet high, so that the best part was lost, and frequent fires besides did great damage. Under the improved system all that is now forbidden; no trees in the first class have been cut except under the supervision of the Government officers. They are systematically inspected, both by the forest officer and by the revenue officers, and the department, although in its infancy, is year by year improving. The profit was apparently greater from granting licenses, because there was less outlay, but the waste under this system was excessive; it led to the destruction of the forests. Many of the native Chiefs have adopted our method of conservancy, and have admitted the advantages. By the appliances of machinery, it has been endeavoured to facilitate the cutting down of the timber, and to supersede the use of the axe as much as possible, by the introduction of the cross-cut saw and other instruments. By the introduction of timber-carts, many large pieces of timber have been carried out that would otherwise have been lost, and every encouragement has been given to the extension of saw machinery, for the saving of time and labour. There are saw companies in Burmah, Bombay, and Assam; there are also saw-mills at Madrepore, in the Punjaub. The increasing scarcity of elephants has added to the anxiety for additional saw machinery. The trained elephant, it appears, is worth nine or ten rupees a day, or equal to the labour of fifty coolies. The Rajah of Travancore and the Rajah of Cochin, both excellent forest managers, preserve their elephants with great care, whilst our legislation has generally tended towards destroying them. The capture of wild elephants has several times been entrusted to the forest officers, who from their position, are specially able to perform the duty. They have been extremely valuable to the department, and the mischief which they do when in a wild state, is more than outbalanced by the services they perform when captured and trained. Every year they are becoming fewer, especially in Southern India, and their destruction must be considered a mistaken policy.

For revenue purposes, the forests are divided into reserved and unreserved, the reserves being for those from which everybody, except the Government officers, are excluded; but cuttings are allowed in the unreserved, with the permission of the department. There are also forests which have been appropriated to the villagers in some cases, where they have, by custom, the right to cut wood to make their implements, and to procure leaves for manure and twigs for fuel. The Government officers cut in the reserved forests as the timber is required, and for the purpose of keeping the rotation of the forest. The trees that are fit for cutting are cut, and then sold, and brought to the account of revenue. The mode in which the revenue is collected from the public who are allowed to cut timber is, sometimes by licenses, and sometimes by a royalty or seignorage upon the timber taken away. The summary of the different reports shows that, in 1868-70, the total receipts were 403,[illegible], and the charges [illegible], giving a cash balance of 179,184; but upon a difference of the valuation of timber at the commencement and at the end of the year, the net profit of the department was 316,600l. The gross revenue have steadily increased since 1863-64, when the accounts were first kept separately; and although the expenditure has largely increased, it is because timber establishments were necessary from the damaged condition in which, through long neglect, the forests were suffered to fall. The gross receipts for 1871-72 are estimated at 575,[illegible]0l. and this average is, without doubt, due to better management. According to the present system, an annual forest budget is prepared and submitted to the Government of India, who scrutinise it with great particularity, while necessary establishments are liberally sanctioned; the greatest economy in management by controlling officers is insisted on. One great item of expense now being incurred is for the demarcation of the forests, the vast area of which have been but little known. This work is important, as it will enable the Government to concentrate, and so to economise establishments and labour. Not much has yet been accomplished, but the work is proceeding steadily in all parts of India. Another source of expense arises from the necessity of sending out skilled people from England, and the employment of skilled people in India; but when the training school is established, and the natives can be employed, the expenditure may be less. There is also a liberal allowance in every budget, for the improvement of the communication, for roads, for the blasting of rocks in the streams, and also for forming new plantations. There are indirect influences connected with the progress of forest management that have had important bearing upon the general property of the country. In certain districts the dwellings of the natives are constructed of better materials, more especially in the Mahratta country, where the rich ryots use seasoned timber, and have better door-posts, and better constructed dwellings than they had a few years ago. The inland depots have enabled them to get seasoned in place of the coarser wood which they had formerly to use for the purpose.

The railway and other public departments receive their supply on half-yearly indents, which was not the case formerly, when there were great delays and uncertainties as to the quality of the wood, from want of seasoning. The department has greatly aided and expedited the formation of the railways and diminished their cost. By correspondence and otherwise, the officials have often been required to indicate the nearest points where various articles should be obtained—for instance, telegraph poles, handles of tools, and other necessaries for the ordnance department, and for gun-carriages; for the medical department, supplies of gamboge, kino, sarsaparilla, and other minor productions; for the school of arts supplies of box-wood, and satin-wood for wood-engraving and picture-frames. Considering the vast territories with which the forest service deals, and the present imperfect knowledge of the botany of India, there are probably a great many products as yet unknown, which will become commercially important.

The village forests, which come more especially under the Board of Revenue, have only received the attention of the officers of the forest service by way of advice, supplies of seed, and general recommendations. The officers have been fully occupied with the large areas, and the village tracts do not come properly within their duties. The fees paid for cutting down the wood go into ordinary revenue or local funds. In Madras, inducements have been held out to villagers to plant topes and groves, by giving them land, rent free, for a certain number of years, and, in some cases, advances for wells. Circulars in the vernacular have been circulated by the collectors and civil officers, recommending particular trees for particular soils, and the Agri-Horticultural Societies of the different provinces have distributed seeds. Some of the wealthier zemindars take a pride in having trees, and have done a great deal to force and their growth. The natives generally cultivate fruit trees more, and other wood sufficient for their wants; but they do not anticipate the wants of future generations. The cultivation of trees is highly desirable, both for their own use and for climatic considerations; there is more moisture in the air from the presence of trees, less suffering from the hot winds, and less desiccation of the ground. The general effect may be seen to some extent in the north west and in the Punjaub, where good inducements have been held out, but the extraordinary pressure for wood on account of the new railway has latterly induced the natives to sell their trees. There has been an enhanced value for all minor forest produce, such as gums, dyes, oils, lac, bees-wax, &c., which were formerly not taken any account of at all in the revenue. Any person brought away ivory or bees-wax, or anything that he chose, from the forest; now, in most provinces, these are put up to auction.

Before the attention of the Government was given to the forests, the denudation had gone to such an extent, that there was not only a scarcity of timber and fuel, but the climate was seriously affected. There was reason to believe the rainfall had diminished very considerably, and the climate was becoming arid. The first teak plantation of magnitude was commenced by the late Mr. Conolly, in Malabar. Subsequently, sandal-wood was planted in Bengal, red saunders and other trees in Madras, deodar in the intra-mountane valleys of the Himalaya. The success of the "Conolly" plantations makes the description given amongst the additional matter appended to the report of the India Committee useful for the imitation of forest cultivators. In 1844 several large blocks of land, covered with jungle, and estimated to embrace an area of 20,000 acres, were obtained by the Madras Government, on perpetual lease. The first plantation was commenced in 1844 by Mr. Conolly, the collector of Malabar, who, in 1855, met his death at the hands of Moplah assassins, and in whose memory these plantations have been designated. The area annually planted was at first 100 acres, but they were reduced to about 50 acres, until, in 1863, it was again increased to the original extent. The plantations are situated on undulating ground along the banks of Beypoor River, near the village of Nellambour, about ten miles from

the foot of the Western Ghauts, and forty miles from Calicut on the coast. Towards the north and east, the Nellambooor district is sheltered by the western Ghauts and Neilgherry-hills; and being open to the south, and so near the sea, the climate is particularly moist during the monsoon, while, owing to its sheltered position, the heat at all seasons of the year is excessive. It is, in short, a "forcing climate" as regards vegetation, and so much so, that Nellambooor is compared in that respect by some to a huge conservatory. The area planted up to date, with teak, is about 2,000 acres. The plantations extend, in narrow belts, a distance in all of six miles, and vary in width from a quarter of mile to a mile, having a stream on one side, and either paddy-fields or low jungle on the other. The soil near the banks of the streams is a rich alluvial deposit of great depth, with, in some places, a large admixture of sand. In December, at the close of the north-east monsoon, the jungle on the site selected is felled, and prepared for burning, which usually takes place at the very close of the dry season. In April, before the setting in of the rain, nurseries are formed in a part where water can conveniently be had. The seed, after being steeped forty-eight hours in cold water, is sown on raised beds of fine mould, which are then covered with straw, to prevent a too rapid evaporation, and are kept moist by constant watering, until the seed germinates and the young plants break the ground, which is generally within a lapse of from twelve to twenty days. As soon as the rains commence, the plants are put out in line six feet apart, and at six feet distances within the lines, the plants in every alternate row being opposite the vacancies in rows next to them. They are placed in pits a foot square and a foot deep, filled with good surface mould. A plantation is generally four years' old before it is able to keep down grass and other jungle by its shade. To prevent fire, a broad belt several yards wide is cleared around the boundaries of the plantations, about the middle of the dry season, and peons, accompanied by coolies, are sent to examine this cleared track every second or third day, to see that no further accumulation of leaves and inflammable matter takes place. The reports of all officers who have visited the plantations agree that the selection of land was excellent, as regards climate, soil and the facility for the export of timber, and other circumstances. At the first glance of the older plantation, from 12 to 24 years of age, they do not fail to be struck with the magnificent growth of the trees; the largest are from 5 ft. 7 in. to 5 ft. in girth, with straight, cylindrical stems, 60 to 70 feet in height. These are found, more or less, in alluvial soil close to the streams; elsewhere, the growth of the trees, although in many parts excellent, has not been so rapid. The most remarkable feature, however, of these plantations is, they have been established at a very small cost, and appear at this time to be self-supporting.

An account of the descriptions of timber that may be grown with profit to the Government was given by Mr. Cleghorn, a gentleman who possesses a thorough knowledge, from personal observation, of the forests in different parts of India. By far the most valuable of all Indian woods it appears is the teak, the chief supply coming from British Burmah, the forests of Malabar and Canara, and the Central Provinces, where the growth is comparatively small. The first-class for ship building, takes from seventy to eighty years to arrive at maturity, and for house building about twenty years. Previous to the formation of the forest service, the agent for the East India Company engaged in the purchase of timber, for the men of war at Bombay, had been withdrawn in consequence of the destruction of the teak. At present, in addition to the Malabar plantations, operations to a large extent have been decided upon in British Burmah, above Rangoon, and elsewhere. Black wood stands next in importance, being of great value for ordnance purposes, house-building, carved furniture, and for the use of cabinet makers, it is exported in considerable quantities. It is now planted in the same situation and often alongside the teak, and can be obtained in equal size. Ebony is a tree of great value; it is also sold by weight; the cultivation, which requires many years, could be much extended, although this has not been found necessary. The sal wood is found in that large tract, the Terai of the Himalaya extending from Assam to the Kangra valley. This belt of sal is broadest in the east, and becomes narrower as it proceeds north-west; the northern limit is between the Suthej and the Beas; the southern near Vizagapatam. It attains a very large size in the forests of Oude and of the Terai. It grows very close, and propagates itself in a manner different from other trees; the seeds fall viviparous into the ground, so there is comparatively little trouble in the management of the sal forests. The wood is used for engineering purposes, ship-building, and very extensively for house-building in Upper India. It takes a long time to season, and is very peculiar in some respects; it becomes seasoned after a course of years, but it afterwards floated, it absorbs the water, and gains weight more than any other wood, but it is especially liable to attacks of the white ant. Sandal wood is confined in its growth to the plateau of Mysore and the adjoining country. The quantity is very large, yielding an annual revenue of between 10,000 to 15,000l to the Mysore State. It extends as far as Coorg, and north to North Canara. Plantations have been formed within the last few years, which are being extended annually. It is a small tree, which reaches maturity in twenty years. It is sold by weight, and the chips, fragments, and sawdust, are used for the extraction of oil. The cinchona cultivation has been remarkably successful in the Neilgherry hills, at Darjeeling, in Ceylon, and elsewhere. The growth is rapid, and the bark is valuable at an early age. The introduction was due to Mr. Markham's researches in the slopes of the Andes, and the cultivation is being extended by the forest officers. There is a scientific chemist, a quinologist, stationed at Ootacamund, engaged in extracting the alkaloid, and it is confidently expected that this will affect the value of quinine, although the effect has not been felt at present. There are seven or eight species of bamboo, which are used for scaling ladders, and various purposes of domestic economy; by the natives it is applied to an infinite variety of uses, and, next to the cocoanut, it is the most valuable wood in India. The rattans grow in great abundance in the forests of Malabar; it is a species of palm, the stem of which runs along the ground to the length of 80 to 100 feet. There is a very large trade in rattans, from the forests of Singapore, to China; it forms a valuable article of export. The larger description, called the *Calamus rotang* is commonly used for walking sticks. The Malay Chiefs derive a considerable revenue from granting the privilege of cutting rattans in their forests, which do not come under the forest department. *Cassia lignea* exists in abundance in the Malabar forests. It is an inferior variety of bark, resembling cinnamon in smell and appearance. Wild cinnamon is not much sold at present, but for all such articles there is an increasing demand. Cardamoms grow spontaneously in the jungles where coffee planters have settled. In Coorg and Wynaad there is a considerable cultivation, and revenue is derived from them. Pepper is a natural produce of the Malabar forests, and a great article of commerce; the cultivation has been made the civil authorities. Most of the pepper jungles in Malabar are private property. Caoutchouc and gums of similar properties are found largely in Assam. There are various gums, the gum gamboge, gum kino, and many other species. Kino is used for calico printing, and gamboge is a pigment and a medicine. There are several trees besides which produce vegetable colours, the chayroot, for example, resembling logwood. Dammer is a product yielded from various species of the wood-oil family; it is much used as a substitute for pitch, and by the varnish makers. The pimento has been introduced, but only very sparingly, on the western coast, into Travancore and Cochin; it is only grown in gardens, and not sufficient for commerce. The bread fruit is cultivated and grows well on the western coast; this, with the cocoanut and beetle-palm, belong also to to the gardens. The cocoanut exists entirely on private lands. The palmira tree is extremely useful for rafters of houses, for fishing stakes, and harbour stings and other similar purposes, as it resists the action of the sea for many years. The casurina, or beef-wood, has been planted in the sandy shores north and south of Madras, and at various places on the opposite coast. It is of very rapid growth, and it possesses the property of durability under water; being very hard, it turns the edge of the axe. It has a peculiarity which belong to few fast growing trees, of being extremely tough and durable. Satin wood attains fifteen inches in diameter; it is very useful for picture frames and fancy purposes, and resembles the American maple. The mahogany is not indigenous in India, but the seeds have been received in considerable quantities from the West India Islands within the last few years, and plantations have been commenced in Bengal and other parts.

Besides these great varieties, all of which may be turned to future account, there are certain kinds of dog-wood and allied species, found to be useful for the manufacture of charcoal; several woods also that produce good bark for tanning. The native leather merchants remove under permits from foreign officers in certain places, the bark of trees marked out for the purpose, chiefly the *Cassia auriculata* and the *Acacia catechu*. The great heat is not favourable to the process in the south, but at Meerut, in the North-west provinces, tanning is very successfully carried on. Amongst the exotems of the forest produce, there is the honey and bees-wax, in the collection of which the hill tribes have prescriptive rights that have never been interfered with.

British Trade Journal.

The Planters' Gazette.

BOMBAY, 21st June 1872.

TEA ESTATES.

It is satisfactory to learn that Indian tea continues to hold its own firmly in the London Market. Although the stock compared with that of the corresponding period of last year shews an increase of nearly 2,000,000 lbs., no fear of a decline in prices is felt, as the China teas of the season are very unsatisfactory.

The London correspondent of the *Darjeeling News*, under date 12th April, sends the following account of a late auction of Assam teas, at Thomson's Tea Mart in Mincing Lane:

"The sale room, which is not very large, was crowded with buyers, but it struck me that the bidding was not very spirited. I was all the more surprised at this, as some of the samples offered were really very good. Had China tea been selling, I could have accounted for the apparently sluggish market. The prices too, at which the lots were knocked down, I thought rather meagre, except in a few instances, though I was astonished to see a lot of *red leaf* sold at no less a sum than one shilling and four pence per pound, and that too *in bond*. I enquired of a Broker, who was standing by my elbow, the reason for this red leaf fetching so good a price, and he answered "because the quality is very strong." What he meant by this expression I do not yet quite understand, but if he means that red leaf is generally considered a superior article, then

all that can be said in its favour is that, after all, it is not such a *drug* as some people imagine." The correspondent states that among the numerous lots offered for sale, he did not see any from Darjeeling, though a week before a large consignment of fifteen hundred chests was put up for sale, with what result he could not ascertain.

Relating to the prospects of tea in Cachar, a correspondent of the *Bengal Times* writes that, plucking and manufacturing are continued according to the show of leaf. Some gardens pluck very severely, others more sparingly. The former method is believed to be highly injurious, and to impoverish the bushes.

"It's a pity," he complains, "that more unanimity does not exist among planters. They form a splendid body of men, and can pretend to very considerable friendship among themselves, while their hospitality is proverbial. Could they, as they ought to do, unite more in purpose, it would be difficult to limit their influence. The re-engagement *bonus* is a subject of much discussion among them. When time-expired men re-engage, it is the rule—a compulsory one—to pay them a certain sum which varies according to circumstances, and the managers who have to pay it. I understand that in one of the gardens it has been reduced to Rs. 9 and under for a season's re-engagement, but the general average would probably be from Rs. 10 to Rs. 20, and has been as high as Rs. 30 to Rs. 40 for a term of three years."

COFFEE ESTATES.

The Madras Standard hears from the Shevaroy Hills that the French merchants formerly purchasing large supplies of coffee there on Madras and Pondicherry account, have not entered the market this year. This is owing to the duty levied by the Government of France on coffee imported into that country. English merchants are however trading largely in the berry, and are reported to have bought extensive supplies, the result being that prices have risen to Rs. 6-8 per maund.

CINCHONA.

THE two reports on cinchona cultivation, one by Mr. Broughton our Quinologist, the other by Mr. Howard, the celebrated manufacturer of quinine, are the first really practical reports on the cultivation of the plant that we remember to have seen, and we can recommend them confidently to cultivators of cinchona. There are two points specially to be noted. The first is the discovery that farm-yard manure largely increased the yield of pure quinine, indeed has to a great extent succeeded in eradicating those objectionable compounds cinchonidine and cinchonine. Seven per cent. of pure quinine *versus* two when unmanured, may indeed be considered a most decided success. There can be no doubt now about high cultivation for cinchona. We ourselves long ago predicted that guano would prove a valuable manure for this plant, and science has now confirmed our views. It is fortunate for planters that the Government Quinologist is located here, as they can at once take advantage of his discoveries and profit by them. When Mr. Howard wrote his report, the manure experiments were not before him, or he might have been even more sanguine of an excellent future for planters, than he is. It is satisfactory to find that we are cultivating the right sort of bark, and that, according to Mr. Howard, this generation will not over-do the supply. The price which the bark has brought on the market—2*s.* 7*d.* per pound—is very satisfactory, and could planters only afford to wait, there is no doubt an excellent return in store for their outlay.—*South of India Observer.*

COFFEE.

COFFEE IN AMERICA.

From a New York Price Current dated March 23, we quote as follows:—"The long continued stagnation in the market for Brazil has been somewhat disturbed by the arrival of the steamer *Merrimack* with 5,363 bags and letters a couple of days later. Her circular advices, both from Rio and Santos, are detailed in another column. Simultaneous with these accounts, we have reports of considerable sales of Rio in the Southern markets, anticipation of the spring trade, soon expected; and though the Tariff question is still unsettled, business with the interior has but slightly increased, there is evidently a little more hopeful feeling here, and our quotations, which we do not vary, are considered by some as rather below than above present market rates. It may be noted as a remarkable fact that notwithstanding our large stock, a very large proportion of the good and better qualities is held by one or two houses. The whole of 1872, so far having witnessed little else than a downward market, the opening of spring is looked for hopefully for a large distributive demand to the country, which is known to hold light stocks. Stocks on the seaboard keep up, and are probably ample for any emergency."—*Ceylon Observer.*

A PLANTER'S PARADISE.

OUR up-country friends will read enviously the following description by the *Madras Times* of the immunities enjoyed by residents on the glorious Asamba hills in the Travancore district, from some of the commonest evils of planting life in Southern India. Our contemporary says:—"The borer is hardly known at all there; wind is only destructive in certain localities; drought is only known in the very low plantations; and fever is remarkably absent from those hills, which are situated so close to the sea." But as there was a serpent in Paradise, so there is a set-off to the delights of the Asamba planter's life. As Bishop Heber sang of Ceylon, so may our neighbours on the opposite coast sing "every prospect pleases and only man is vile," for the *time* goes on to tell us that "whilst these curses of Indian coffee planting,—borer, wind, drought, and fever, are absent from these favoured hills, the planters are, however, afflicted by very heavy tax imposed by a Brahmin in power." We need hardly explain that the latter reference is to Sir Madava Row, the Prime Minister of the Rajah of Travancore, who has imposed a heavy export duty and land tax, which are described as crushing in their effects.—*Ceylon Times.*

COFFEE AND CHICORY.

WE have often said that the coffee producers has less to fear from genuine chicory than from the many compounds sold under its name at very low prices. Genuine chicory—the wild Endive—in small quantities really adds piquancy to coffee, and we can call to our recollection when in Flanders more than forty years ago, tasting coffee thus flavoured which we thought far superior to anything we had tasted in England. We have all heard of the enormous strides made in the consumption of coffee in America, yet it seems that the consumption of genuine chicory goes on simultaneously in that great continent: here is an extract from a California paper on the subject, but it must be understood that the term *manufacture* of chicory does not employ any mixture of several ingredients, but simply the slicing and roasting of the root and ultimate grinding of the brown substances into a fine powder, and final compressure into small tins in which it becomes almost solid. How is the article in question:—

CHICORY IN THE SAN JOAQUIN VALLEY.

"MESSRS. MEINE & RAAB are preparing to establish a chicory manufactory in this city. Mr. Meine is a practical manufacturer of the article, and has had much experience in the business in some of the most extensive manufacturing establishments in Prussia. The experiment has been tried by these gentlemen at a point on the San Joaquin river a few miles from this city, but, unfortunately, just about the same time the machinery was put in successful operation, and all the necessary apparatus in working order, the factory was destroyed by fire. They propose to manufacture chicory on quite an extensive scale the coming summer, and with that end in view, have entered into contract with several farmers to supply the green chicory. It is expected that not less than two hundred and fifty acres of land, bordering on the San Joaquin and Calaveras rivers will be dropped with chicory the present year, and it is estimated that the yield will range from fifteen to thirty tons per acre. The yield last year on some land near the San Joaquin river averaged the latter amount. Fifteen dollars per ton is, we understand the price paid by the manufacturers for the green article. Samples of the quality manufactured by the gentlemen named have been sent to merchants in New York, Chicago, St. Louis, and other large cities in the East for inspection, and the uniform verdict of dealers is that it is far superior in quality to that imported from Prussia, Holland, and other Eastern countries. The quantity of chicory consumed annually in the United States is enormous, and the demand is almost wholly supplied from abroad. It is probable that not less than a thousand tons will be manufactured by Meine & Raab during the coming summer.—*Ceylon Times.*

COFFEE IN HOLLAND.

THE last Dutch Trading Company's sale, although small, passed off heavily as we have already heard; the markets in Holland have however since maintained a firm tone in consequence of holders declining to give way. The reduction effected at the Company's sales is said by the Rotterdam correspondent of the *Public Ledger* "to place the article in a more sound position, as it may prove conducive to an increased demand on the part of the dealers in the interior, whilst holders on their part also evince more firmness in view of

considerable deficiency in the supplies on their way to Europe from the countries of production, which will cause stocks to get materially reduced during the next few months."

We know this was the case in regard to Brazils and Ceylon, but we were not equally well informed as regards Java. Taking as our guide the returns in the *Ledger of March 29th*, we find that in Java there had been received in store, and expected at the latest date 505,431 piculs against 1,053,510 piculs in 1870, or very nearly a half of the quantity. The *Observer*, in analyzing the figures in the *Public Ledger*, has omitted the receipts from private estates in 1871 = 64,430 piculs; although including them in his figures for the previous year, no wonder, therefore, that holders in Holland were firm in their demands.—*Ceylon Times.*

THE COST OF ARTIFICIAL MANURES.

The following analyses and calculations of cost of several descriptions of manure may be worth inserting for the information of coffee planters. They have been lying among our papers for some time, having been furnished by an experienced farmer in the North of Scotland, as referring to artificial manures which he had used with satisfactory results on his land. He, and his brethren, had proved after a good deal of costly experience, that they could never depend on the qualities of the artificial manures received from the large manufactories. The increased demand was soon found to lead to very extensive adulteration. Some of them accordingly formed a company, erected the necessary machinery at considerable cost, and importing the raw material direct from South America and other places, proceeded to manufacture not only for their own use, but for that of the farmers in the surrounding districts. Our visit to the manufactory was a very interesting one, and it was then (some three years ago) that the following figures were furnished as the analysis and cost (delivered at the manufactory close by a shipping port) of some of their principal artificial manures:—

Name.	Analysis.	Cost.
No I. Bones	209 of soluble phosphates 143½ „ insoluble do. 23 „ ammonia	per ton cash. £7 10
No II. Bones and Coprolites.	211 of soluble phosphates 156 „ insoluble (changed after) 112 „ ammonia	£6 10
No III. Super Phosphate Bone Ash.	305 of soluble phosphates 86 „ insoluble „ Nil „ ammonia	£6 10
Mineral or Coprolites	262 of soluble phosphates 67 „ insoluble (stationary) Nil „ ammonia	£4 15

This practice of farmers combining to procure raw material from which to manufacture artificial manures, is rapidly spreading, we understand, in agricultural districts elsewhere both in England and Scotland.—*Ceylon Observer.*

THE COFFEE AND TEA EXPORTS OF INDIA.

Reserving comment on other points until Monday, we devote a special paragraph to noticing one portion of Sir Richard Temple's Budget Speech. He stated the exports of coffee from India in 1871 to have reached 33½ millions of pounds, or, as nearly as possible 300,000 cwts. Continental India, therefore, sends into the markets of the world a quantity of coffee equal to about one-third of the Ceylon export. We may take it for granted, however, that the *production* of coffee in India is much larger than the mere figures for export indicate. Our calculation is that Ceylon produces on an average 1,000,000 cwts., of which only 100,000 cwts. or one-eleventh is locally consumed. Looking at the much larger population and different circumstances of India, we may take it for granted that at least one-fourth of the coffee produced in India goes into local consumption, or say 100,000 cwts. against the 300,000 exported, 400,000 cwts. in all being produced. If this is at all near the mark, Ceylon and India produce of coffee,

Ceylon.....cwts.	1,100,000
India..... „	400,000
Total...cwts.	1,500,000

Or 1½ millions of cwts., of which 200,000, or less than one-seventh, is retained for home consumption.

But tea, which has not yet been even fairly tried in Ceylon, is rapidly becoming one of the principal staples of India. The export of 13½ millions of lbs. in 1871 could not represent more than one-half the production; for not only is tea everywhere a favourite beverage with the natives under British rule, but recent advices tend to show that Indian tea is rapidly supplanting the China leaf in the countries of North-Western and Central Asia, which formerly received all their supplies from the Celestial Empire. Hardly tried as the coffee planters of India have been with drought and borer, and other visitations of a disastrous kind, we still believe that the coffee trade will expand steadily if not rapidly. As to the production, local consumption, and export of Indian teas, he would be a bold man who would set limits to the expansion of each. The weaker flavoured kinds which do not find favour in the English Market can be sold cheaply to the natives with vast benefit to the health of the latter. Plenty of tea and coffee available as beverages, and plenty of quinine as a febrifuge, the value of life in India and the consequent increase of population and commerce ought to be, in less than a generation, most marked.—*Ceylon Observer.*

THE COFFEE PLANTER'S MANUAL AND THE COST OF OPENING ESTATES.

The "Planter Manual" with its various additions was just leaving the printer's hands when the letter of "Sceptic" appeared, criticising the estimates framed by Messrs. Schmadlen and Brown, of the cost of opening a coffee estate. We were unwilling to send the work forth without some explanation of the moderate estimates of the writer of the "Manual," in reply to his critic, and accordingly have been pleased to receive the following remarks which shew that experience is not wanting to substantiate the calculations made by Mr. Brown:—

"My object throughout the work was to shew on how low a scale a coffee-plantation *can* be opened by a man of small means, *with great care and economy*, not to shew *how much can be spent in doing the same work*. This has been sufficiently illustrated before, and at the cost of many a proprietor. If I omitted *General Transport*, I have been liberal in some matters that need not be entered upon till the estate be in bearing, such as *roads*. Of course an estate cannot be worked without roads, and he who has plenty of money will do well to open them early. But I am all along supposing a man who has *not* plenty, and who therefore will only do what is absolutely necessary at first, leaving complete and finished work to be done when the means to do it with come to hand. Now in this respect were I to be very exacting, I would for the first two years make £10 spent on roads do the work for which I have allowed £50. Besides the item which I am charged with having omitted, *General Transport*, consists chiefly of bringing the superintendent's provisions, and those of his coolies to the estate. As I have supposed the case of the estate until bearing being managed by a neighbouring superintendent, no allowance on that score was necessary, while as regards rice to the coolies it is generally supplied at a rate that covers its transport, unless in very out-of-the-way districts. I adhere therefore to my figures, and I will tell you further that they are not framed upon new Dimbula experience with soft soil and small holes, nor on the plan of shirking work and stinting expenditure. My calculations are based upon proper work and 18 inch holes, and are the same as they were 20 years ago. About that time the young estate I referred to was planted under my inspection by a very careful manager of an adjoining estate, and brought into bearing for £10 an acre. Of course it had the advantages of the old estate adjoining, supplying lines, bungalow, tools, and other conveniences with which the new estate in the same connection had not to be taxed. The estates opened and brought into bearing for £8 per acre was not connected with any previous estate in the district. The books which I saw proved my figures correct. I do not say everybody can do this nor will all seasons or soils admit of it. But I instance these to show what can be done under favouring circumstances, while the average rate allowed by me is fifty per cent. higher. In their estimate too I am borne out by such men as * and many others, all practical planters, who would not spend a penny unless absolutely necessary, nor stint a penny that was actually required. I do not, however, wish to be drawn into a discussion of estimates or anything else at present. I shall let everyone say his say, and if there be anything of importance to answer, shall take them all up together at the end and reply. *Sceptic* rather takes a liberty in criticising the work done by the £8 and £10 per acre men; seeing he does not know one of the estates to which I referred. They, however, would well repay inspection, but that must be invited by their proprietors, not by me. All I say is that in both the work was well and satisfactorily done; one has yielded handsomely paying crops for many years, the other (only 7 or 8 years old) has done so since its 3rd year, when it yielded 10 cwts. an acre."—*Ceylon Observer.*

THE REDUCTION IN THE COFFEE DUTY.

Coffee has long been regarded with decreasing favour by the British public, and its consumption here has steadily declined for the last thirty years. There is no satisfactory reason to be addduced for this change, for though our nation does not excel in preparing any substance which requires skilful cooking, our cousins in the United States are no better cooks than we are, and they consume four times the amount of coffee than we do. Nor is there any innate dislike on the part of the public to good coffee, for nothing is better liked on the rare occasions when it is to be had. We think that a good deal is due to the neglect with which coffee has been treated by the retail trade, owing to the trouble that its preparation entails, and to the comparative ease with which tea can be sold. But there can be no doubt that the reduction in the duty gives an opportunity to the trade of greatly increasing their sales of coffee, and that the public may be very easily brought to consume much larger quantities than it does now. We do not

think, however, that the trade will increase as it should do, unless the retailers more generally roast their coffee themselves; for roasted daily, and ground almost immediately before use, the finest qualities lose the greatest part of their excellence. If sound Native Ceylon be roasted carefully, ground immediately, and infused without delay, its fine flavour and fragrance will surprise those who have not tried the experiment. It is estimated that the cost of fuel for roasting the cwt. is only four pence, while a proper machine for roasting can be obtained from £5 10s. and upwards. It is frequently said, by those not in the trade, that only rubbish is kept in this country, and that all the fine kinds go to the Continent, but the exact contrary is the fact, and the finest qualities all come to England, while the commonest kinds are used in France and Germany. The difference therefore is simply in the roasting and grinding, and in the preparation of the infusion.

Apart from the comparative neglect of the methods of preparation by many members of the trade, coffee is made what is called a leading article by very few. No doubt the reduction of the duty will lead to a considerable increase among those who endeavour to attract the public attention to coffee, and this will greatly increase the consumption. For instance, a very excellent coffee can, after the new duty comes into effect, be retailed with a fair profit at a penny per ounce, and the wonderful effect of appealing to the poor through their most current coin, is too well-known to be insisted upon. Fair common qualities unmixed with chicory, can also be sold to the public at 1s. per lb. Again, a mixture of one-half of good plantation and one-half of fine Mysore, which makes practically one of the finest coffees obtainable, can be retailed at 1s. 7d. per lb. Southern Indian kinds, and particularly those grown in the Mysore district, are without doubt the finest coffees grown, and the old public prejudice in favour of so-called Mocha is utterly baseless now, whatever it may have been in former years. In fact, much of what is imported as Mocha is not equal in quality to common Native Ceylon. We regret that the duty was not altogether taken off, instead of being halved, but a reduction of duty equal to 70 per cent., or ½d. per lb. on the roasted product, cannot fail to be a very sensible help to an article which has so long suffered from heavy taxation.—*Produce Market Review.*

SHEWING HOW A COFFEE PLANTATION CANNOT BE PROPERLY OPENED IN CEYLON UNDER £25 AN ACRE.

DEAR SIR,—It is not often that matters connected with coffee-planting in Ceylon are noticed by our friends in India; it was, therefore, with a certain amount of pleasure that I perused the few extracts you were pleased to give us in your issue of the 2nd, from a pamphlet entitled "Young Ceylon."

After indulging in a few pleasant little anecdotes, our worthy author proceeds to explain the process of opening up land, and supplements his observations by a row of figures, which he is pleased to term an estimate of the cost of the various items of expenditure, and adds, moreover, that we may consider it reliable.

Now, although Mr. Anderson may be, as you suggest, a very clever young man, he has most certainly stultified himself in the matter of this so-called estimate, and his figures are unfortunately not quite so reliable as his vocation would lead us to expect.

Not being gifted with the same fertile imagination as our festive Banker, we must be content to follow the ideas he is pleased to give us and imagine if we can, the "happy youth"—for so he designates the young planter—commencing operations by lining his 100 acres clearing, premising, however, that the talipot hut he lives in is erected *for nothing*, and that whatever personal supervision he may be disposed to give to the various works is gratuitous, and forms no part whatever of the estate expenditure. The process of lining he describes as being simple, *so simple in fact as to be costless* (vide estimate), and although he indicates that pegs are necessary, he believes most firmly that they are cut and collected by some exceptionally accommodating Hindoo for nothing. Now-a-days we are not so fortunate, and are generally content to pay from 5s. to 6s. per acre for the proper completion of this work. Our attention is next invited to the "Holing and Planting" which, if one may judge from the estimate, are done both together, and without the intermediate and evidently superfluous operation of re-filling. But to return to the holing, which we will assume for the sake of argument he has allowed £160 for. Now has Mr. Anderson or any other Mr. Anderson ever known a clearing to be *properly holed* at a cost of £1 per acre? I am aware that some planters cut as many as 80 *nominally* eighteen-inch holes, but in *reality* what are they? Let the intending investor satisfy himself by a visit to the Eldorado of Ceylon. Holing to be *properly* done represents £1 10s. per acre *at least*, and careful re-filling may be fairly estimated at 10s. per acre. With regard to planting we are not designed much information, but the purchase of plants, rather a formidable item in an out-of-the-way district, is a matter too insignificant to receive his attention. The other items in his first year's expenditure are ordinarily correct. We now come to the second year, which, he regards omissions, is a fitting continuation of the first. Topping, staking, suckering, draining, &c., are in the opinion of our economical Banker works, if not altogether unnecessary, at least too insignificant to render an estimate of their cost necessary, the wretched Talipot hut still exists, and the lines erected in the first year are as waterproof as ever. So much then for our "reliable" estimate!!

It is the incessant croak of the so-termed ready writers, who do Ceylon so much harm. The not improbable result of Mr. Anderson's effusion will be a flood of small capitalists into the Colony, who with £1,000 in one pocket and "Young Ceylon" in the other, will rush headlong into the first speculation which offers, and of course come to grief. If Mr. Anderson would content himself with his counter, and leave the framing of estimates to men more competent to the task, he would receive the thanks of those who have a soul above "Cash Credits," and who know far better than he possibly can the advantages Ceylon offers to the capitalist.

Practical men know but too well the cost of opening up land as it *should* be opened, and although possibly the modern planter is backed up in his tight-laced notions of economy by men of such standing as Mr. Brown, still it requires but a glance at the estates opened up by these £8 and £10 per acre men to convince the most sceptical that economy can be carried too far. You have difficulty in ascertaining the direction of the lines, the holing is not worthy of the name, the roads, if any exist, are dangerous to walk upon, and the term *closely* is applicable in all sides. Land, to be thoroughly opened up, drained, roaded, with permanent buildings, &c., represents £25 per acre at the end of the third year. If done at a lower figure, you may be pretty certain that something has been neglected, and the property is not what it should be.

Mr. Brown estimates nothing for "General Transport," "Miscellaneous," "Draining," and Contingent Expenditure. Lining he thinks can be done for 2s. per acre, while the cutting of pegs is supposed to cost half as much again; surely under this latter head Mr. Brown must have included the cost of lime for whitewashing them!

It would be well to ventilate this matter as much as possible, and ascertain from men of experience in the new districts the actual cost of opening up land *properly*.

The estimate Mr. Sabonadiere has been pleased to furnish us with, is nearer the mark than many supposed. It is, however, somewhat difficult to follow his arguments in favour of building a £300 bungalow for the superintendent the first year, assuming (as he himself assumes) that the estate is managed and brought into bearing by a neighbouring planter. What right, however, have we poor d———s to be nice? It is not every day we have the experience of so distinguished a manager to guide us, and although possibly we do not share with him the amusement of dabbling in mud and mortar before it is necessary, still it is satisfactory to know that there is no occasion to do so.

Yours faithfully,
SCEPTIC.

[Marring the quaint tone of this writer's references to Messrs. Sabonadiere and Brown, we consider his letter a valuable and sober statement of the truth. With holes as large as they ought to be, and the valuable potash, charcoal and surface vegetable matter drawn into them thoroughly, £25 an acre on £2,500 expended on 100 acres at the end of the third year, is not too large a sum to calculate on. Expenditure restricted in the preliminary operation of planting and holing must mean larger expenditure or smaller returns in after years. Coffee land ought, if possible, to be trenched and permeated by stank drains. As such operations are (financially) impossible, the greater the necessity for large holes, and plenty of paths, roads, surface drains (deep) and water holes.—Ed. C. O.; Ceylon Observer.]

TEA.

NEILGHERRY TEA.

THERE can be no doubt that these hills are well adapted for the growth of tea. A few individuals have chosen a higher elevation than the cold valley, (about 7,000 feet above the level of the sea), where the Government plantation is formed. A glance at the plants is sufficient, however, to prove this to an experienced eye that, though better tea is turned out at higher elevations, *larger* quantities are obtained lower down. Thus Kotagherry, Kodamad, Coonoor, and the numerous ravines having any aspect but a S. W. one, will be found the most suitable localities for the formation of tea plantations. Forest land, if possible, should be secured; the less precipitous it is the better. And as drought is not unusual at certain seasons, care should be taken to provide for water being led to any part of the site selected. Most of the Neilgherry plantations have been formed by men who seem to have cared to secure a pleasant residence above other considerations, and therefore most lands best adapted for the cultivation of tea are still untouched. There are about 6,000 feet above the level of the sea, and with good Nybria, plants are likely to produce an on average 600 lbs. of tea per acre. But from what has recently transpired in Assam and Cachar, no one can tell what a tea plant properly trained will yield, and as those provinces at present are, commercially speaking, the model tea countries, intending planters such as are prepared to encounter some inconvenience cannot do better than select land, the climate of which might approach that of those valleys as nearly as possible, taking care not to go

low enough to get within the influence of the hot winds. There are thousands of acres of good land available here, and tea will thrive at elevations of from 2,000 to 6,000 feet. The nearer the estimate to the plains the greater the yield, and less the difficulty experienced in procuring labour. The valley of the Bowhani resembles that of the Burrumpooter, and as until the forests are cleared the place would be unhealthy, people opening tea plantations there could reside at Mettapollium, riding to and from the clearances, so as to avoid sleeping in the jungles. It has been proved beyond doubt that 200 acres of cleared land can be rendered perfectly healthy, however dense the surrounding forest may be. Private individuals might not be found able or willing to commence with an extensive area, but a company properly constituted might with ease do so. The success that has attended the cultivation of tea in the eastern provinces of the empire, places them in the front rank of tea-growing localities. A like success I think would attend the enterprise in Southern India in such localities as I have referred to. In fact, tea planting in this district could be commenced under far more favourable auspices than those the Bengal companies started under. They had everything to learn, and more than a million sterling have been spent in what may truthfully be said learning the business. A tea company working in the Bowhani or elsewhere in the Neilgherries, would avoid the mistakes that absorbed the capital and disheartened shareholders in Eastern India. We know the best paying plant, the cost of working an estate to a pie; consequently, although Indian teas have still some drawbacks such as want of sameness in flavour, we can, I am sure, put a remunerative article in the market, if the Madras Government would open the tea lands thoroughly to the public by adjuring their present prohibitive policy, and do away with the quit-rent. These unproductive mountains would soon contribute no inconsiderable sum to the imperial revenue, by yielding immense quantities of an article of duty. Take for example the produce of 1,000 acres, properly worked as the property of a company. Such an estate would pay £1,500 on 600,000 lbs. of tea, but were the present obstacles removed, some idea may be formed of the enormous benefit to Government when I state that out of the estimated area of 1,000 square miles in the Neilgherry district, fully 400 or 250,000 acres are fit for tea cultivation. Even if half this produce is entered through English custom houses, the Chancellor of the Exchequer would not close on 200 millions sterling annually. Again, 60,000 Europeans would be necessary to superintend this vast area, and 265,000 labourers would find employment—no slight consideration when one thinks of the "horror in Orissa" as one London paper called the famine of 1866. I am, I assure you, not drawing an exaggerated picture. Tea is purely an agricultural pursuit, and I put it to you to say whether, considering the immense tracts of land brought under tea cultivation in various parts of the world, since the beginning of the present century, I have stated anything like an impossibility.

The methods of manufacture adopted by the tea planters on the Neilgherries differ considerably from those in vogue in other parts of India. There are exceptions, however, who adhere to the plan laid down in Bengal. But many of the planters here seem to have struck out a process for themselves, especially in drying the tea, and the high price of charcoal has compelled them to resort to other means of curing the leaf. A series of trays are placed in a close-fitting frame-work supported on a sort of iron cistern, below which is the furnace. The teas so prepared are not dried, but baked. Now although the article has been well reported on both in Calcutta and London, and finds a ready sale, I find it entirely deficient in aroma. I cannot presume to account for what I am about to relate, but I simply state facts that can be vouched for by any planter who may have been in Cachar in 1860-61. In 1860 a gentleman found the cost of charcoal a heavy item in his manufacturing charges, and hit upon a contrivance for doing away with it altogether. This consisted of what was known as the sand table. Some two inches of sand was spread upon an iron plate fixed in masonry having a wood fire below, and the tea was placed in trays on the sand. The object of spreading the sand was to deaden the heat. The first few samples of tea thus prepared met with pretty good favour, and forthwith everyone went in for sand tables. Fortunately, the quantity of tea turned out in Cachar was small; for in June the next year a gentleman largely interested in tea, and himself a professional chemist, wrote a letter from London containing the broker's opinions, as also that of some agricultural chemists totally averse to the sand table scheme. It was stated therein that the *tea received some gentilification from the direct action of charcoal that was absolutely necessary*; and so charcoal has been used ever since, with what result may best be seen on a reference to the share-lists. Neilgherry tea has not reached the London market in sufficient quantities to allow of its qualities being properly tested. I do not know why the tea dried over the tables in 1860 was not at once condemned; and had it been, a considerable loss would have been avoided.

Neilgherry tea is at present rather more of a curiosity than a commercial commodity, and is sold in the country at higher prices than Assam tea is sold for. Hence many proprietors have got a notion into their heads that their teas will always command these high prices. The average value of Indian tea in the London Market for the last ten years has been one shilling and six pence per pound. It would be well therefore if owners of estates reckoned upon realising this in the end.

Although great improvements have of late taken place in the teas of Southern India, there is room for much more, and one's money might be well spent in a trip to Darjeeling for instruction on this subject. What the Neilgherry planters require is experience in manipulation, and in the training of plants. I have seen a large proportion of sour tea up here, and have witnessed many and results of ignorance with regard to pruning, from the system of chopping down the plants to the ground, to that of picking the bushes into shape, which only result in clumping the stems as to utterly exclude light and air.—*Correspondent of Indian Statesman.*

MARKET REPORT.

LONDON, MAY 16, 1872.

SUGAR.—The market continues very strong for good refining qualities, and prices are again firmer. Common without change. 750 casks British West India sold—Jamaica, 31s. to 34s. 6d.; St. Vincent, 31s. 6d.; Antigua, 31s. to 34s. 6d.; and 750 bags Jaggery Madras, at 23s. 6d. Of 630 bags Mauritius offered in public sale, nearly the whole sold. Syrups, middling to good brown 30s. 6d. to 32s. 6d.; colory 30s. For arrival 1,000 tons Madras sold landed terms—Jaggery, 23s; Palmyra ditto, 23s. 9d.; grainy, 25s. 6d.; 6,700 bags low brown China, for arrival, at 24s. 6d. landed terms; and four floating cargoes for the United Kingdom, one of 650 hhds. St. Vincent, at 27s. 6d.; one of 370 hhds. Trinidad, at 27s. 6d.; and two of Havana—one 2,000 boxes No. 11½ to 12 at 30s. 6d.; and one 350 13 to 13½, at 31s. 6d. Refined firm but not in active request.

COFFEE.—The parcels offered to-day sold readily, at fully yesterday's currency. 600 casks, 20 barrels and 540 bags plantation Ceylon all sold—triage, &c. 67s. 6d. to 71s.; small to low middling gray, 71s. to 77s.; middling to good middling bold 77s. 6d. to 84s.; peaberry, 80s. to 91s. 6d. 30 cases East India, 75s. 6d. to 76s.; 30 packages Mocha part sold, good yellowish, 100s. 90 packages Jamaica, fine ordinary to low middling colory, 71s. to 77s.; 500 bags Costa Rica, 71s. 6d. to 74s.; and 200 bags Guatemala, fine ordinary, 75s. 6d.

CALCUTTA, 3RD JUNE 1872.

INDIGO.—There is but little of interest to add to our last advices about the Crop. In *Kishnaghur* and *Jessore*, the strong sun after the late rain, has been most beneficial, both to the October and late-sown plant, but in all the other districts of *Lower Bengal* a good general fall of rain is much needed to relieve the plant and also to accelerate manufacture.

In *Eastern Bengal* the yield from the plant shows some improvement on the former returns, and as the weather has lately been more favourable, we trust the same may continue.

The advices from *Tirhoot*, *Chumparun*, and *Cheprah*, with a few exceptions, continue generally favourable; rain is wanted for the late sowings, and there are some complaints of the plant burning; planters expect to open vats from 10th to 15th instant.

From the *Benares Provinces* and the *Doab* we continue to receive complaints of excessive heat, and want of rain in most *Zillahs*.

RAW SILK.—Bengal Silk has become less unsaleable as last in London; Reuter's Telegram of 31st May quotes best Purriah 8 & Fine 9s., and best native Skeinsw, at 20s. 6d. per lb., and a fair business is reported to have been done. However, the improvement, due to throwsters being actually a little short of work, and therefore compelled to touch the long-repudiated article, may cease as new European Silk becomes more abundant on the markets, and the New Chinese and Japanese Silks reach home. Some reaction, therefore, is quite possible in the month of August, and there seems very little occasion for owners here becoming very firm holders, or asking for higher rates. The stock of Bengal Silk in London, is still a very commanding feature in the trade, and even should the European crops fall short, larger supplies than usual may be expected from China and Japan.* The sale of 9 Bales J W Cassimbazar at Rs. 20 and 18 Bales G M J at Rs. 19, is about the only transaction since our last issue. Stocks are very much reduced, and little more March Bund profitless is expected.

TEA.—Several small auction sales have been held since our last issue, comprising in all 1,430 packages, and of this quantity only 1,120 changed hands; the rest being taxed with high limits, had to be withdrawn, and will probably go forward on planter's account. The Teas offered were nearly all of Assam growth, and although the quality was not very good, they commanded brisk competition and sold at other high rates. The first arrivals of New Cachar Tea, and also being landed, and will be submitted to public competition in the course of a few days.

The news from the home market is dull in the extreme, and this will no doubt cause a more moderate tone to prevail here as soon as the supplies become more plentiful.—*William Moran & Co.'s Circular.*

THE

SUPPLEMENT TO THE "INDIAN ECONOMIST."

Agricultural Gazette of India.

A MONTHLY JOURNAL DEVOTED TO THE IMPROVEMENT OF INDIAN AGRICULTURE.

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Agricultural Gazette of India.

CONTENTS.

LETTERS TO THE EDITOR.

MR LOGIN'S EXPERIMENTS.

To the Editor of the Indian Statesman

SIR,—As you take so great interest in my experiments on cotton cultivation, I have no doubt the following information regarding my prospects in the line will not be without interest.

First with regard to the Model Farm in the Umballa district at Chaudes, ten miles below Kalka, and on the Umballa and Kalka road, I am happy to say it is progressing even better than I anticipated

Mr Lloyd, the superintendent in charge, only reached Umballa on the 23rd May So after I had selected and pointed out the land to him, and the thaseeldar fin all fifty acres to begin with for this season, and two hundred more hereafter), the land had to be made over; and on the 18th June Mr Lloyd writes to me that one third of these fifty acres was, up to that date, already sown, some of the plants appearing above ground; one third would be sown by the end of this week, and the remainder, if the rains hold off, in ten days

There was some difficulty at first starting as to labour, but latterly this was overcome, so that progress on the whole has been satisfactory, even beginning so late in the season; for the great thing is to have the plants well above ground *before* the rains regularly set in, where irrigation is available as in this instance.

Except from seven or eight acres, which had been previously ploughed, I do not expect any great out-turn, for ground which is only ploughed, a few days before it is sown, can't be expected to yield such a crop as that which has been exposed to atmospheric influences for these last five months, and has been reploughed several times I think it best here to mention this, as in October next there may be some disappointment; and so great were my fears on this point that at one time I had great doubt of the advisability of starting a model farm so late in the season. However, as the Deputy Commissioner has been so expeditious in making over the land, and the Superintendent so active, I think there will be a respectable show at Chaudes of cotton plants in October, when the Simla residents move Calcutta-ward.

The zemindars are taking to this Egyptian system more readily every day, as they come to know more about it; and twelve miles south of Umballa on the G. T. Road, I hope to have some twenty or thirty acres under cotton; but here the sowing can't be begun till after the great fall of rain, as there is no irrigation in this neighbourhood At Kurnaul I have few acres under a Mr Deacon, sub-engineer, from which I am expecting grand results, far surpassing last year's. This land has been under preparation for these last five months, and the seed was sown at the end of May; so the plants are now about one foot high, I believe.

Again, twenty miles north of Delhi, a small plot of ground was similarly treated, and the sub-overseer reports that it will, he expects, beat the 500lb. yield of last season; while Mr Lloyd expects great things from his plot of ground ploughed early in the season. Thus there is got up a healthy spirit of competition at three different points, each over fifty miles apart; and I trust I may get up a similar emulation among the zemindars also. A few rewards given to them as prizes would have a great effect, as the silver watches given by Government to two of my sub-overseers has had with the establishment; but what has perhaps done more than anything else is the great promise from the plants of last year at the field at Rae, which returned the 500lbs. of clean cotton per acre

In February last those plants were pruned, the earth dug up about the roots, and heaped up about the stems of the plant. The field has been twice watered, and has up to the 11th instant, yielded 20 seers of "kapas," at the rate of 161lbs. of clean cotton per acre. There were severe storms on the 8th and 9th instant, which destroyed a great many blossoms and pods, and even stripped some plants of their leaves; but this may do good in keeping them rather backward for a time till the rains are over.

This good promise of a second crop has no doubt had its effect on the minds of the zemindars, but here an unexpected stumbling block comes in the way, for I am told that the Hindoos (not the Mahomedans) believe that to pluck two crops off the same cotton plants is sure to bring bad luck, and will cause a pestilence among the cultivators, or a murrain among the cattle

All that can be done against this is to hope that the chuckes will disappear out of the district, and that the cattle will not be diseased, so that the cultivators may be induced to grow the cotton plant not as an annual, but for three or four crops as in other countries, where great care is bestowed on the culture of the plant.

One thing is however, I believe, certain by this experiment, that with care, cotton can be grown as well in India as in any other country in the world, and if we can but teach the people this lesson, by showing how this can be effected, it will be a step in their agricultural education of far more value to the country than all the learning in science and poetry we have been able to instil in their minds for the latter, it is to be feared, has as yet only shaken their faith in the ancient creeds of the people, without filling up the void thus made, so that an unstable generation is sprung up around us on every side

On the other hand, teach the people how they can by a little care better feed and clothe themselves, and we should prove that we have their real good at heart, and this once done among the agricultural population, there can be nothing to fear. This being the case, all who have the opportunity should aid rather every attempt at improved agriculture.—I remain, dear Sir, yours obediently, S. LOGIN.

TEA PLANTING IN THE N W PROVINCES (AND ELSEWHERE.)

To the Editor of the Indian Statesman

SIR,—I see several letters in the last *Agricultural Gazette* on Nilgherry tea planting, which the writers aver to be a very great success, as no doubt is is If the writers who write up the Nilgherries had stopped at proclaiming the success of the new industry, it would be all very well, but unfortunately they must follow the old practice of running down other localities by way of contrast This is not quite fair, especially as the writers seem to have little personal experience of the said other localities I allude to the Himalayan cultivation. But if the Nilgherry men think I intend to "crack up" Himalayan tea prospects at their expense, by recapitulating all their disadvantages (and perhaps inventing one or two,) while I conceal all those belonging to my part of the country, they are mistaken It is time all this kind of absurd and injurious rivalry should cease, I say injurious for it manifestly tends to injure the enterprise *as a whole* and prevent the investment of capital, and junction of outsiders, thus—*Jones or Snooks*, a Darjeeling or Cachar tea planter, writes a glowing account of the prosperous way things are going in *his part* of the country, but he cannot for the life of him help sneering at or damning with faint praise, the unfortunate condition of affairs which he probably knows nothing of, in the Nilgherries or the Deyrah Dhoon. Some enraged Blue Mountaineer or Dhoonite retorts, not courteously other individuals of both parties join in, and begin a general running down of each other's diggings, each side attempting to prove by Euclid that the other is going headlong to destruction Now, what is the effect of this sort of thing on the capitalist, who looks on, and is possibly thinking of investing in tea shares! Why he alters his mind, and will have nothing to do with tea *anywhere* The same happens in the case of intending purchasers of plantations or grants of land. It is time, Mr Editor, that this short-sighted jealousy should cease. What are the facts of the case? The fact is that the *actual yield of tea* (though not *the quality*) will be found to be pretty much the same *wherever the climate and soil are found suitable to the plant.* Of course in all the dry and arid parts of India, tea wont grow at all (unless artificially irrigated, which is tantamount to the same thing), but in every locality where tea has been regularly entered upon as an enterprise, the

results in the way of actual yield per acre, are much about the same. Would your Nilgherry correspondents "be surprised to hear" that in the N.W. Himalayas, from which I write, upwards of NINE HUNDRED POUNDS per acre have been realised at an elevation *exceeding* six thousand feet. The fact is the elevation (up to 6,500 or thereabouts) matters very little, *so long as the land is good* and *well cultivated*. The reason you hear so many platitudes about the paucity of yield of high elevation &c., is that *good land* is rarely found at high elevations; but given good land 6,000 *feet* for instance, and high cultivation, *the yield* will be the same as at 3,000 feet, with the addition of superior *aroma* and *equal* strength. This I have seen over and over again. The *cultivation* is the thing, plus of course tolerably rich ground to commence with. The sun at 6,000 feet is quite powerful enough to bring out the flushes, if the soil be rich *enough to produce them*. The cold winter of the Himalayas with its sharp frosts (at night) and occasional snowstorms, is in my opinion, an *advantage*. The China plants which alone we cultivate, hybernate and get an increase of strength by so doing. Our winters too though sharp, are short; they don't last above five months at *most*, often not more than three or four even at 6,000 feet. In fact, the whole question may be summed up in half-a-dozen sentences. Never mind about the elevation up to 6,000 feet, but choose good land, and having done so, put fifty rupees or thereabouts into each acre annually in the way of good hoeing and manuring; you will then get 300 lbs. of tea, perhaps more.—I am, Sir, yours truly,

AN OLD PLANTER.

MINERAL AND SALINE MANURES.—VII.

THE IMPROVEMENT OF THE MILCH COWS AND OXEN OF THE COUNTRY.

To the Editor of the

Agricultural Gazette of India.

SIR,—INDIA possesses some noble, and unapproachably magnificent, horned cattle—the "*Nagouree*" bull and cow, taking the precedence and the diminutive but beautiful "*Gainee*" the last place. But the ordinary breed has so degenerated in *size*, *strength*, *bone*, and *muscle*, that like the inferior food grains of the country, they are not worth the trouble and expense of direct improvement, though there is much to hope from the young and rising generation of horned cattle, whose growth would be increased, if their pastures were improved—a subject which will presently be discussed.

In England the utmost care and attention is paid to producing a cow, capable of giving a large quantity of superior milk. The valuable prizes, and to Indians, astounding* prices, which are freely given for such animals, show the perfection at which this class of stock breeding has arrived.

In this (Bengal Presidency) we have strictly speaking no superior breed of kine. The *nagouree* bull, cow, and ox do not belong to us, nor yet another large and powerful breed which in former times supplied us with our Foot Artillery bullocks. The late East India Company, though it did not care a straw for superior cattle, as connected with the agriculture of the country, had a very high estimation of powerful large sized, long legged, fast trotting bullocks for its artillery, and the breed was carefully kept up in the Government Cattle Farms, of Hansi and Hissar in the N. W. P. A Hansi cow in days of yore, was a much prized possession, and to be asked to a dinner, at which a portion of grain-fed, artillery bullock, slaughtered on account of having broken his leg under a gun carriage wheel on parade, was an entertainment not to be declined. The Sikhs however taught us a lesson on the subject of horse artillery, and since those days, notwithstanding the general admiration for artillery beef, the bullock has been banished from the Army, and the once-flourishing cattle farms reduced to comparative insignificance.

The buildings however, are I believe still in existence, and might be again used for breeding purposes. But now comes the rub. Who is to improve the breed of the bull, cow, and ox of India?

The Supreme Government of India has certainly announced its intent of doing so, and this is as it should be, still when the Financial position of the country is considered, the most enthusiastic supporter of Lord Mayo's administration is obliged to ask:—"Where is the money to come from?"

That ample funds can and will be forthcoming, if the measures connected therewith are properly set about, it is part of my duty to prove, but if the money raised for a specific purpose, is to be spent upon something else, then it is better, that matters should remain as they are, private enterprise being assisted to do the needful.

The cows of Hansi, and those of the pure nagouree breed, are I believe reckoned the best, but their immense size is against them, inasmuch as a poor man cannot feed such a cow properly. Even amongst Europeans in India, a very hazy idea exists as to the quantity of food a cow will eat. One hundred to one hundred and twelve pounds per diem is not too much for a large cow, and eighty pounds for one of ordinary size.

I subjoin the dietary allowed daily to an ordinary English cow in explanation of the subject. An ordinary English milch cow, will consume daily as follows:—

Distillery drags from Potatoes	lbs.	50
Rye Straw	"	12
Hay	"	2
Pea Straw	"	1
Oat Straw	"	1
Root	"	12
Total	lbs.	80

In India we do not distil potato spirits, nor are potatoes used as cattle food, on account of the cost. But with the aid of the artificial phosphates, dried pumpkins, carrots, turnips, beet, sugar beet, mangold wurzel, &c., &c., can be made to supply the place of potato drags. Of course gentlemen, charged with the duty of improving the breed of Indian cattle, should instruct the natives in the art of drying vegetables, of which they cannot possibly be ignorant.

The value of the potato drags is intimately connected with the mineral matters they contain, as the subjoined analysis of potato drag ashes shows:

Potash	54·18
Soda	6·17
Phosphoric acid	11·95
Lime	0·00
Magnesia	0·00
Peroxide of Iron	0·00
Common salt	5·91
Sulphuric acid	5·72
Silicic acid	12·12
	100·00

This analysis is very instructive, and shows that the saline manures required, are muriate and sulphate of soda, and saltpetre or nitrate of potash. The phosphoric acid being supplied either by bones, or fossil phosphate of lime. To grow potatoes to perfection, a compost in which all these substances are present should always be used.

In reference to Indian cows, I have been informed, that those of "*Jhang*" in the Punjaub, and those of Scinde, though of moderate size and height, are remarkably good milkers, and if this be true, a superior breed would be secured by crossing with the Ayrshire and improved Kerry bull,

It is stated of Ayrshire cows, that many of them when properly fed, will yield from 6 to 8 gallons (36 to 48 wine bottles) of milk per day during part of the summer. The ordinary cow of this breed, will during the year, yield from 500 to 750 gallons of rich milk; producing one pound of butter for every 2½ gallons of milk. The improved Kerry cows, are stated to be hardy. Their milk, and butter are rich in quality, and for their size, which is small, they are good milkers. Finally, they can subsist and thrive on scanty pastures.

The mounted European cattle fanciers, may cross the *Nagouree* with any approved large sized English breed; but for general purposes, and as a stock to be preserved and perpetuated, I feel convinced the breeds named by me will be found best suited to our (India's) wants.

The produce of the Ayrshire and Kerry bulls, with "*Scind*" and "*Jhang*" cows, should I think when full, or half grown be judiciously bestowed on Zemindars, who have won "*Wheat Prizes*," and a certain number should be given to the sturdy and ancient race of cowherds. ("*Gujar*," and "*Goaly*,") forming a considerable part of the population of the district or zilla of "*Muthra*."

The undeniable success which has attended cattle breeding operations in *Hansi*, shows that the climate is suitable and the soil capable of producing good grass and hay, therefore it would be advisable to make this station the head quarters for the production of young stock, which should periodically be sent to Muthra for eventual sale, and distribution.

* "AUTOCRATIC PRICES."—The attention of the reader is invited to the following from the Supplement—*Illustrated London News*, 27th November 1869.

The Show.—At the Smithfield Club Show, which opens at the Agricultural Hall on Monday week, £1065 will be given in money prizes for cattle, £[illegible] for sheep, and £[illegible] for pigs. The exhibitor of the best gets a piece of plate value £100 and the exhibitors of best pen of sheep, or single sheep, ditto of the value of £30 and £10 respectively. Six silver cups are given as usual, and gold medals to the breeders of the best male and female in the cattle classes.

We hear, among other shorthorn news, that Mr. Thomas Booth has offers from the Americans for either his Lady Fragrant or Patricia. The latter has just had a white heifer-calf by Knight of the Shire. Mr. Booth has also had heifer-calves from Marianne, Christmas Rose, and Blooming Bride; and a bull-calf from Prudence. We learn from *Thornton's Circular* that Mr. Sheldon, U. S., has sold half his herd at a large figure, to Messrs. Wakeett and Campbell, Oneida county, U. S. It includes six Duchesses and five Cliffords. Rumour says 1100 gs. each for the former and 440 gs. for the latter; but this must be taken with reservation. Ten sales have averaged £40 and upwards, and Mr. Stratford and Mr. Thornton have had about a dozen each during the season. The highest bull price was 650 gs., at Mr. Ritch's; and the highest price for a female, 460 gs., at Mr. Bowly's.

The young stock could not be in better hands than that of the ancient tribe alluded to, who will do all that is necessary, provided we on our part conform to their ideas, and place a protective mark, or brand on all kine bred in that, to the Hindoos, most sacred locality.

The "*Gope*," of "*Muthra*," will with actual joy and pleasure enter upon cattle breeding, provided he is assured that the produce will be protected from the butcher's knife; and as this can be easily done by marking all protected cattle on the forehead with a nine pointed star, the Hindoo wish and our object will be contemporaneously attained.

I would place the Cattle Farm at Muthra under the management of a committee composed of the rich and intelligent "*Seths*" of the city of "*Muthra*," and the chiefs or heads of the "*Gopes*" and "*Gouls*," should by virtue of their descent and position, be entitled to sit, advise and vote at such committees, the proceedings of which should be regularly recorded. The committee to be supervised by the principal civil officer of the district who should preside whenever present. The disbursement department should be under an European Covenanted officer. The natives employed throughout the establishment, should be of the cowherd caste, and the care of the young bulls and heifers, should be their especial charge. In immediate connection with this Farm, there should be another, at "*Hurdwar*," and "*Benares*," under the joint charge of *Brahmin* and *Gope* servants—whose duty it would be to keep the young cows in calf, and young bulls for sale to all comers. It is to be understood that no breeding operations are to be carried on, at either of the Farms, the cows will leave "*Muthra*," so as to calve one and a half, or two months after arrival at the branch Farms. The object in view is to have both milch cows, and others about to calve, available for Hindoo purchasers.

The three places named are considered as very holy in Hindoo eyes, and *Hurdwar* is visited all the year round by relatives of deceased Hindoos, who carry the selected, incinerated fragments of humanity, mingled with more or less ashes, to the temple "*Ghaut*," from whence, under Brahminical superintendence, they are consigned to the sacred waters of the Ganges.

The Hindoos consider it a very meritorious act, to purchase a young bull, which after consecration, is set free, and may roam and wander over the land at his will and pleasure.

These animals are known by the English as "*Brahminee*" bulls and are very often captured and turned to account as cart and plough cattle. By having a stock of young bulls available at *Hurdwar* and *Benares*, the pilgrims, visiting these places would purchase them willingly—and the only condition imposed should be that the bull should not obtain his freedom, until the purchaser reached his own home or village. The protecting star should be respected by all, and Europeans, should not be permitted to capture and appropriate such bulls. Their size and superior breed, would make them objects of attraction to all Zemindars who are cattle owners, and through their agency, a better description of cows and plough cattle would be called into existence. Thus the Government would be paid for their bulls, whose future care and usefulness has been provided for.

A milch cow or bull purchased at either of the holy places, would never be ill-used by a Hindoo, and as long as Hindooism lasts, the cow will be venerated, and as it is our object to produce and preserve a superior breed, no more effectual method could be devised for the purpose, than that of employing the Hindoos, and their religious institutions, to carry out our views and laudable intentions.

I feel convinced that the proposed cattle farms would be exceedingly popular with the well-to-do and wealthy Hindoos, as apart from their passion for possessing a superior milch cow, it would enable them to gratify a high ambition, that of presenting a valuable well-bred, milch cow and calf, to a favorite, or favoured *Brahmin*; and when we remember how eagerly such gifts will be solicited by the priesthood, we have only to keep up the supply and the Brahmins will take good care that the purse strings of the wealthy Hindoos are duly loosened for their gratification. By adopting this plan, we will find not only well-to-do purchasers for our superior stock, but secure the extension of the breed. The preservation of the private bred stock, should be secured by the star as before, say to the third generation. It should be explained to private breeders, that the star brand will only be granted when the bull or heifer is the produce of parents similarly distinguished. H.

THE NEILGHERRY ESTATES.

(From a Correspondent.)

THE first point to be discussed in any agricultural letter doubtless is the weather, on which chiefly our prospects for the year depend. The welcome showers of April have in a great measure been denied to us this month, and but that the monsoon must burst ere long, there would be grave apprehensions of a second drought. Coonoor and Kotagherry have experienced but a very scanty fall of rain; but Cotacamund has been a little more favoured. Fortunately the rains of April were sufficient to prevent any harm accruing to planting interests. Coffee is well set and safe by this time, and we are happy to say that there is at present every promise of a fair crop in most estates.

The previous rain was sufficient to set all the tea estates going again, and most estates are yielding good flushes. The young cultivation, of which there is a large percentage at present on the hills, has weathered the drought well. The only losers will be those who have on their hands large areas planted with China plants, which from the dryness of the early part of the year, have persisted in bearing seed instead of leaf. It could not have been expected that they would do otherwise, and planters are becoming daily more and more alive to the fact that this is the least profitable variety of the tea plant that they can cultivate.

Considerable fears however, exist among the natives with regard to the grain crops. That on which the Budaghas chiefly depend for their subsistence is the samee (*panicum miliare*) This crop which was brought in rapidly by the rains in April has since suffered severely from want of rain, and in most places presents a yellow and withered appearance. If the arrival of the monsoon is deferred for another week, the crops will be almost wholly lost. Thus the fields will resume their green appearance, but the ears formed will from defective root-action prove abortive. The only chance the natives have will be to plough afresh, and renew their lands. This however cannot be done after the end of this month, so the chances are strongly against them.

Though the crop should wholly fail, little or no distress will be felt, as the natives of those hills are about the wealthiest class of cultivators in India, and could well afford to pay a little more in the way of taxation to the revenues of the country than they do at present. They live and clothe themselves almost entirely by the produce of their own fields, and lay by in addition to this whatever they earn by working on the various estates in the neighbourhood. The Public Works too pay them a considerable amount every year as wages for labour done on the roads, and the construction of the new Kotagherry Ghat will put no small sum into their pockets. The consequence of all this is that the great majority of them have no inconsiderable amount of silver hidden away somewhere or other in their houses.

It is hard to estimate correctly the total out-turn of tea from these hills for the current year, but it will probably not fall far short of about 80,000lbs. against some 40,000 in 1871. Next year the yield may almost, if not quite double itself again, and the time is not distant when the Neilgherries will hold a proud position among the tea-producing districts of India.

No very recent advice of sales in the London market have come to hand of late, but if what is now in the market or daily expected there from the gardens whose managers understand the manufacture of tea, fetch as good prices as heretofore, we need not have much fear as to the results of tea-planting. It is by no means an easy thing to bring a new article into favour at once, and those who have been the first to export may, when their produce becomes better known and reaches the market in larger quantities, expect to obtain higher rates.

Really the best plan would be for some of the managers of our larger gardens (and these latter are not "very large" yet) to combine for adopting one uniform system of manufacture, and to send home the produce of several gardens together. Two or three hundred chests would command much greater attention at the hands of purchasers, than a lot of small and variable lots, and better prices would thus be obtained.

A correspondent writing to the *Indian Statesman* has called attention to the quantity of "sour tea," that is turned out here. Now there is no excuse for this. Even amateur planters have

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had ample time and opportunity for learning how to detect sourness in tea, and to avoid it in the process of manufacture; and I have no doubt if some of them were to pocket their pride and not be above learning a little, they would do better. As it is, they do a great deal of harm by sending such tea into the London market, as by so doing they only help to give our teas a bad name, which in reality they do not deserve.

Regarding Cinchona cultivation, little has occurred during the past month. The trees are continuing to grow well, but grow as they will, they take a longer time than coffee or tea bushes in giving any practical results. Very small quantities have as yet been sent in for competition to the Home market; but the current year ought to give a better out-turn. The Government have reduced the price of the young plants sold from their gardens from one anna to one pie per plant; and this is a step in the right direction. The cost of making a nursery of cinchona cuttings is merely nominal, and even these low rates ought to pay both the Government and the purchaser.

The question of the construction of the new Kotagherry Ghat is still under discussion. A second meeting of planters and householders was held at the Avenue on May 24th, and it was unanimously resolved that the planters should accede to the suggestions of the Local Fund Board, by subscribing Rs. 3 per acre now in cultivation, and pay the amount on the 1st January every year in three instalments.

The only hitch in the matter is, that the proposed road passes through a small portion of an estate belonging to two gentlemen in the district, and these gentlemen forgetful of the advantages they will derive from the road passing through their property ask for compensation at the expense of their brother-planters. The Local Fund Board have in a weak moment voted them a sum of Rs. 1,500, and with such a chance before them, we fear, their hearts are set not on the benefit to be derived by themselves and the district generally but on the "filthy lucre."

It certainly shows on their part a want of sympathy and co-operation with their brother-planters. For the damage done to their property is "nil," and it brings their estates within six miles of Kotagherry by a good road on the one side, and within 11 miles of the railway terminus at Metapollium on the other. The gain is apparent to everyone.

There is no doubt that Kotagherry, besides being the head-quarters of tea planting on the Neilgherries, is possessed of a finer climate than either Connor, Wellington or Ootacamund. The only drawback to it hitherto has been the want of a good road to the low country. Once that is carried out, we may expect to see visitors flocking to the station. A good hotel might be set on foot, and capitalists induced to invest a little money to advantage by increasing the house accommodation.

Planters on other sides of the hills are calling out loudly at the partiality shown to us in the matter of the ghât, and are further exasperated at the claims for compensation. They say, after this that we don't deserve to have anything done for us. It would however be hard to punish all for the sins of one, and as the compensation voted is the work of the Local Fund Board and not of the planters themselves, we trust the difficulty may be solved.

MODEL FARM—KHANDEISH.

In the recent correspondence in the *Times of India* relating to model farms in general, and to the Khandeish model farm in particular, should have succeeded in attracting the attention of the Government of India to the real obstacles which have hitherto impeded all attempts to promote a knowledge of scientific husbandry, the publication of that correspondence will have been most opportune. Mr. Fretwell of the Khandeish model farm, like many other energetic servants of Government, is inclined to fret at the curb of unintelligent supervision, and to kick over the traces of red tape; and we are bound to admit that if with all the drawbacks of his position, he were able to make the Khandeish model farm a paying speculation, it would be little short of a financial miracle. Mr. Fretwell is aware that the existence of the model farm and his position as Superintendent, are conditional on the state of his balance sheet. He is also aware that the financial success of the model farm has, from the first, been seriously imperilled by the absurdly sanguine estimate which was originally submitted to Government by the Acting Collector, and upon which the sanction of Government was originally granted. Mr. Fretwell was in no way responsible for this original estimate; and we believe that he has, from the first, consistently deprecated being placed in a false position; but these facts are necessary to be taken into consideration in forming an opinion on the Superintendent's elaborate reply to the Berar correspondent of the *Times of India*. Mr. Fretwell is fully aware of the impossibility of doing justice to his agricultural skill, as long as the bugbear of financial responsibility is constantly being thrust before him. We can heartily sympathise with the following sensible protest:—"No man with the Account Department always held in terrorism over his head, can lay his plans with the freedom which an agriculturist should possess to adapt his work to the exigencies of our very uncertain seasons. However well he may be supported by his immediate superiors, he must always be cramped in his motions by the knowledge that every item of his estimated expenditure must be made to fit in with the ideas of half a dozen officials, who may, or who may not be acquainted with the A B C of agriculture, but who cannot under any circumstances come to a just decision without an acquaintance with the peculiarities of the locality in which the farm may be situated." Mr. Fretwell proceeds to express the opinion that notwithstanding all these drawbacks, Government model farms ought to, and will pay when properly supported. The support which Mr. Fretwell desiderates, and which would doubtless improve his chances of success, is a support which would practically place the Superintendent in an independent position, and would absolve him from all pecuniary liability in the conduct of the farm. This is a support which is inconsistent we fear with the existing relations between the Superintendent and the Government, and which would necessarily entail an outlay very considerably exceeding that which Government proposed in establishing the farm. We do not for one moment believe that model farms conducted by Government agency can ever be successful financially; and if financial success is to be the sole condition of the continuance of model farms, the sooner the Government gets rid of them the better. But why we ask should this condition be admitted into the question at all? Has knowledge no pecuniary value? Have scientific experiments no value but what can be estimated in money? May we not regard the outlay on model farms, as the price we have to pay for an exact knowledge of the thousand and one problems of Indian agriculture, of which we are at present absolutely ignorant? Where have we any reliable data for determining the average produce of different soils per acre? What do we know of the chemical properties of Indian soils, and of the most valuable manures for the various Indian crops? How little do we know of a scientific rotation of Indian crops, and of the complete revolution in husbandry, that may be effected by the use of improved implements and more careful farming? These are some of the problems for the elucidation of which our model farms are not only invaluable, but simply indispensable. We should be sorry to see such an excellent institution as the Khandeish model farm collapse on grounds which no sensible man can consider adequate. The Khandeish model farm never will pay in a commercial sense, and if the Government took it up as a commercial speculation, they have good grounds for being dissatisfied with the delusive prospectus which induced them to sanction its establishment. But a Government model farm is *not* a commercial undertaking, and its success or failure cannot be measured by a commercial standard of profit and loss. Our readers may be interested to know that the chief institution of this sort in England, though aided with all the science and skill of learned professors, is notorious as a financial failure. We allude to the Royal Agricultural College at Cirencester. Let the

Government then once fairly finds the fact that a model farm is a costly article of acquiring a scientific knowledge which cannot in fact be acquired in any other way; and let it cease harassing Mr. Fretwell with the ever present bugbear of financial failure. We object to the term "model farm" as in some degree obscuring the main object of the institution. The model farm should be transformed into a "farm for experimental purposes" and a careful course of experiments should be annually prescribed by the local Government to be carried out by the Superintendent under certain known and fixed conditions. The registration and publication of its results obtained, would be of incalculable value to Government, and to all who are interested in agricultural improvement. The model or experimentary farm as an institution, is yet in its infancy. Its success has hitherto been disturbed, and its chief object misunderstood, through the idle speculations of amateur agriculturists, who were aware that a parsimonious Government can only be moved to sanction anything new, by the project of a favourable balance sheet. But now that the financial delusion has exploded, we may hope that the true uses of model farms may be more correctly appreciated by the Government. We would have a model farm in each district, not necessarily on so costly and extensive a scale as in Khandeish, but as the recognised head-quarters of an officer whose duty it should be to conduct experiments and to carry out agricultural operations, on some fixed and definite plan. The Government might determine from year to year what allotment would suffice for the experiments, which it would require to be carried out; and for this allotment provision might appropriately be made in Local Funds' Budget. The Superintendent of experiments in cotton cultivation should not be allowed, as at present, to hire fields at random, but should be directed to work in connection with the model farm Superintendent. In some collectorates, such as Ahmedabad and Khandeish, there is no lack of interest in agricultural subjects: but the efforts made are spasmodic and undirected, and the results attained are utterly incommensurate with the labour bestowed. The annual agricultural show at Mhyjee is a most excellent institution, but the locality is in many respects inconvenient, and it is a great pity that the agricultural interest which is awakened at the show, should not be associated in some direct way with the Government model farm. If this show, instead of being held at Mhyjee, were held at the model farm, which is only a few miles distant, it would we think increase the general interest in the farm; and would enable the ryots to form an intelligent opinion regarding the value of the new agricultural machinery which is annually exhibited. A portion of the model farms in each district, might very usefully be reserved as a nursery for young forest trees. Year after year, an enormous amount of seed and labour is wasted by unskilful planting under the directions of the various Mamlutdars, who know as much about growing forest trees as they do about European cookery. The forest department would find a regular supply of young forest trees most valuable, and the experience and scientific knowledge of the Superintendent would be of the greatest value in determining the best site and soil for forest purposes. In short, by placing the model farm as an institution upon a sound and sensible basis, the knowledge and experience of the Superintendent can be utilised in a hundred ways, and Government will find that the annual outlay in the local budget will, in a few years, be more than repaid by the scientific value of the knowledge which will be acquired, and by the general interest in agricultural improvement, which will certainly be awakened.—*Indian Statesman.*

MANURES

If statistics were collected of the various components of valuable manures that are allowed to run annually to waste in this country, those engaged in agricultural pursuits would find that stimulants and renovating agents now imported at high prices could be manufactured at a tithe of the cost, if not on the spot, at least within accessible distances. Night-soil, the deodorization of which forms a regular branch of trade at home, and which here in our Presidency towns is entirely neglected, would if properly managed double the out-turn of most products of the soil; while the municipalities, by chemically treating the refuse of their sewers could add materially to their revenue. Colonel Gunnel by utilising deodorised night-soil provides its planters with a cheap fertilising manure at a fair remunerative rate, and so gets rid of what in most towns is a source of dangerous epidemics. Were a like system carried out in all places where facilities exist, (and in what towns do they not) prolific as the soil of India is, its capabilities might be largely enhanced while a new industry would be introduced. Objection may be taken to this particular article by way of prejudice, but as very few hands would be required to apply it, men of low caste could be retained for the purpose, while the coolies could prepare the land or plants beforehand. We are not acquainted with the component parts of the "Tea plant manure" now advertised in the Calcutta papers, but it seems hardly creditable to the planting community that necessity for its importation should have arisen: however in drawing attention to the matter our duty ceases. Bones too are thrown away all over the country, and though small quantities are exported, probably not one-tenth of the total produce, is ever utilised. It is needless to enter into minute calculations on the subject, but supposing that one ounce of bone be proportionately allotted as wastage to each consumer of animal food daily, a fair idea may be formed of the commercial value of the article so carefully gathered for use in other lands. Those who travel much about, see skeletons of animals almost at every mile, bleaching in the rain and sun. Could the *chumar* caste whose occupation during the rains chiefly consists in taking off the hides from animals washed down our rivers by the floods, be brought to understand that the bones of the stripped carcass are almost as valuable as the skin, we might obtain a great portion of what at present goes unheeded to the beds of our streams where their valuable phosphates are lost to us. Bone collecting, crushing, and grinding recognised as a trade at home is all but entirely ignored here, yet the amount of raw material procurable is immense and the demand both for home use and export exceeds the supply solely for want of men enterprising enough to enter upon the business. Crushed bones we note are advertised for sale by suppliers of the Wynaad coffee plantations at Rs. 70 per ton. Though many may think the matter insignificant, it is a fact that the bones from a single household estimated at 4 cwt. per annum would supply manure for half an acre of tea or coffee. We have thus indicated two of the most valuable as well as the most readily obtainable manures. Ashes and cinders that form unsightly heaps in and around native huts and even in the compounds of Europeans, beside other so-called refuse all more or less possess fertilising virtues which should not be easily lost sight of.

THE NELLORE DISTRICT AGRICULTURAL SHOWS.

It is some time since we received a copy of the Proceedings of the Government of Madras, in which is published a Report on the Agricultural Shows recently held at Addanki and Nellore. We had hoped, in the pages of this Report, to have found something that might enable us to give our readers some information, as to the kind and quality of the stock and produce exhibited; but we have failed in finding any information whatever on these points. The Committee state that, "there was again a falling off in the number of cattle exhibited "at Addanki, though at Nellore, there was an increase in the "number shown." And all they condescend to inform us, regarding the different classes of cattle exhibited is, that one class was "a finer lot than last year;" that another class was "a fine show, first prize holder a magnificent beast;" of another class they say "prize beast good, otherwise an indifferent lot;" of another class "an exceedingly fine show, very "beautiful cattle." It is impossible to make any sense of this What Agriculturists care to know is in what points the cattle of the district excel, whether they are good draught

cattle, are rapid fatteners, or are good dairy cattle? For what were the prizes given; for cattle suitable for draught, for feeding, or for the dairy? A cow that might be highly suited for breeding dairy cattle, might possess no points indicating its fitness for breeding draught, or fattening cattle, while one possessing all the points characteristic of a rapid feeder, might be altogether unsuited for breeding dairy cattle. Classification by sex and age, is altogether unsuited for such cattle shows for a cow fitted for breeding good dairy cattle certainly should not compete in the same class with an animal suited only for breeding draught or fattening cattle.

It is unfortunate, that amongst the stock judges we find the name of no veterinarian. In England, it is usual to give the judges at a cattle show, the assistance of a veterinary surgeon, even though the gentlemen selected as judges, are generally the most eminent stock breeders and graziers in the country. Surely then a committee of stock judges, composed of a collector, two sub-collectors, an engineer, a superintendent of police, a couple of tahsildars and a sheristadar needed some professional assistance to aid them in awarding the prizes. We fear that these exhibitions as now conducted, will do a great deal of injury in unsettling the minds of breeders in this head-or-tail-way of awarding prizes, who will altogether fail discerning any principles to guide them in their future operation. We would strongly recommend that in all future exhibitions of the sort, the classification of the stock should be so altered that prizes may be awarded for some special excellence, or suitability for a special purpose. Amateur judges of stock should always be requested to judge by points, and the marks they award to the prize animals should be placed on record for comparison with the marks awarded to prize takers at future shows. A drawing or photograph of one or two typical animals of each of the principal classes should be prepared; the characteristic points of each class should be clearly indicated, and the estimated value of each point marked thereon in figures; with such assistance non-professional judges cannot go far wrong in their decisions, and stock breeders will have something definite to guide them.

Agricultural produce was very poorly represented. Three handsome prizes—Rs. 200, Rs. 100, Rs. 50, for cotton, only induced two competitors to come forward; surely there is something wrong here, as few ryots can afford to despise such prizes, The prizes offered for indigo produced a rather better result. But, *why is agricultural produce confined to Cotton and Indigo?* Does the agriculture of the district yield nothing but these productions? The Agricultural implements class was almost an entire failure. We cannot look upon the general results of these shows as satisfactory; much more might have been expected from an expenditure of something like Rs. 6,500; but it is something more than money that is needed to get up a good agricultural show; high prizes alone are not sufficient, and the people must be satisfied that the persons appointed to award these prizes really possess the necessary knowledge.

AGRICULTURE IN EUROPE.

(From our own Correspondent.)

PARIS, JUNE 15.

AN unnatural continuance of cold, of rain, and the absence of sunshine, have already told upon the farmers' prospects most seriously. In this "the leafy month of June," the sky continues overcast, the air is humid, one time very hot, another very cold. The wheat crop suffers from rust and rank, choking weeds, and the flowering period is occurring under the most unfavorable circumstances. Hay has to be made while the sun does not shine. In fifteen departments, the vineyards have been more or less injured by the last frosts, although proprietors have resorted to the old plan of burning tar or naphtha during the clear cold nights, to produce artificial clouds to rest as a canopy over their choicest vines. In the department of the Cher, most singular, the farmers complain of the drought, while their neighbours lament the deluge. In some localities exempt from insects since ten years, the vermin have returned, and from the ravages they are committing are making up for their absence. In other places—Paris and its vicinity for example—the common fly has become a curiosity. Then the political situation is bad; the agriculturist is essentially a man of peace; he pays his taxes after having his growl like every one else, but asks in return security and tranquility. Again, there is the new military law by which every able-bodied man from 20 to 40 years of age must become a soldier, with liability to serve five years on active duty. Agriculture will of course have to support even the bulk of this tax, but only demands in exchange, that the soldier on resuming civil life shall not have contracted a distaste for rural work by immigrating to the large towns.

The cattle plague is not so violent, but still retains its hold on the north of France About 150 animals per week are officially reported under the heads of dead, slaughtered, ill, or suspected. This was about the state of affairs in March last. However, no confidence can be placed in the official figures; the French themselves disbelieve them. Slaughtering the affected cattle, carefully burying the bodies, destroying every disease-germ where such may be suspected, and isolating infected districts—these are the only measures found to be efficacious. In Russia, where the plague is endemic in the cattle districts, the Government has renounced the experiments it had ordered to be undertaken on the subject of inoculation, finding the method to have failed as a preventive.

France is rapidly giving up the old and defective plan of making hay by the continual turning of the grass till each blade is directly dried by the sun. Under a clouded sky but with the air dry and warm, the grass gradually parts with its tissue-water, and requires but little turning over to arrive at the necessary dryness for being ricked. Too much shaking affects the color and the aroma of hay, two marketable qualities sought after; further, the plant loses much of its leaves and flowers by the shaking process, and Pierre has demonstrated, these are the parts of the plant richest in nitrogen. These remarks apply with greater force where clover or lucerne may be in question. In Flanders, after the clover is cut, it is allowed to remain a few hours on the sward to *die*; then it is made up into sheaves more or less bulky, these again are united into circular stocks, and the conical point hooded by a sheaf. The forage dries well in this position, and can resist the rain for several hours; the leaves are not shaken away as in the common plan. A few hours before being carted off the field, the sheaves are opened, when all dampness disappears. Should the weather prove persistently wet, the stocks should be changed from time to time to avoid bleaching the aftermath. The "Klapmeyer" process demands tact, prudence, and fine weather. When the clover is cut, it is gathered into large cocks and compressed with care; fermentation ensues and much heat. After two or three days the cocks are opened, and the forage dried, then, put up in cocks again for a new fermentation; afterwards opened, dried, and ricked.

The question is still being warmly discussed as to the relative advantages of grazing cattle, or converting the grass into hay for the stall-feeding of stock. The opinion seems to be that where meadows can be well irrigated, grazing is not the most profitable plan of culture.

In Belgium the chief incident to signal is the increasing rarity of the celebrated dray horse; the Government is occupied in the purchasing of stallions that breed—their services to be gratuitous.

Efforts are being made to promote bee-culture in France under the auspices of a Central Society. The pupils of the rural schools will receive prizes for every hive they can maintain; the German or "Dzirzon hive" is that which is coming into favor. Parents are reminded that as an article of food, honey is most excellent, and can be used as a substitute for butter,

which commands double the price. With the season for employing artificial manures, comes the necessity for guarding against adulterations. The French authorities recommend farmers to purchase no cheap chemical manures; to compel the vendor to set forth in his account the composition of the manure sold; to obtain a sample of what is purchased, requesting such to be sealed in a bottle by the seller, and forwarded to the appointed chemist, who will analyse it gratuitously. The sample is to be selected promiscuously from the sacks when delivered. This plan has successfully checked adulteration.

In a recent agricultural show two new features were much remarked: prizes for a set of instruments including thermometer, barometer, microscope, lactometer, sugar-tester for beet juice, &c. and also for a cattle medicine chest were awarded.

The *phylloxera* continues its ravages on the vine. Soot, lime, carbolic acid have been tried, but only with partial success; one farmer has even watered the infected roots with white wine. The prize of 20,000 frs. offered by the Government for a perfect cure has yet to be won. Like the cattle plague, destruction of the infected is the best plan. Switzerland has interdicted the introduction of vine stocks either from France or Italy. Stocks of the American vine "Isabelle" are now being tested as to their alleged power to resist the insect; the grape of that American species up to the present has been employed to give a *bouquet* to some French vines; it is intended to graft native cuttings on the American favorite. During the war, France imported much forage from Algeria; and in the neighbourhood of Blois, Orleans, and Vendomê, where the cavalry were picketed quite an African flora sprang up in places that were sandy wastes, and hitherto stranger to all vegetation; 157 distinct and new species have been reckoned, some reaching three feet in height.

EDITORIAL NOTES.

A Model Farm has been started in the neighbourhood of Umballa. The site selected by Mr. Login is on the high road to Kalka, where all who travel to and from Simla, need only to spend a few minutes to see for themselves the farm. At Chundoo, its locality, there is a supply of water from the Gugger river, sufficient to experiment upon the *actual volume of* water required for different crops for different soils. The farm was started at the close of May, but we must not look for any favourable outturn, as the time for sowing was already passed. The time has not however been wholly lost, for operations have been commenced to prepare a few acres of land for cotton cultivation.

Wild pig, as planters know, have a passion for Poonac, and the best plan to keep them away from poonac manure when applied to a coffee plantation, is published in the *Ceylon Observer* by a planter of experience. He uses cacoona oil in which gunpowder is dissolved, the smell of which drives the animal away. Small pieces of gunny bag saturated with the oil should be tied to a piece of stick and covered with a cocoa-nut shell to prevent the oil being evaporated. The oil should be applied to the [illegible] every six weeks, and water sprinkled on the poonac two days before applying it to the coffee so as to pulverize the poonac, which can thus not be so easily eaten.

The sunflower deserves attention as a profitable article of cultivation. The *Helianthus annus*, grown in India, has a kernel equally good for food and for burning. It contains fifteen per cent. of a mild oil, a fact that ought to be better known than it is among manufacturers. Hens are said to lay well by feeding them on sunflower seeds, while the leaves may be used as fodder for cows. The stems are useful as sticks for peas and beans, yielding a fertilizing ash when burned. The sunflower yields well on good soil as also in moist places; the great advantage gained in the latter case is that it destroys marsh-fever and malaria.

4 July.

The State authorities in California have engaged an arboriculturist, for the setting out of forest trees in different parts of the State. They never, says the *Rochester Express*, did a wiser thing. "Our forefathers found two fancied enemies when they landed on this continent—the Indians and the forest. They proceeded to exterminate both, and their folly, transmitted to their children, has been nearly successful. We may never regard the Indian as a friend; but our feeling towards the forests have changed. We want trees judiciously distributed everywhere: on the mountain side, in the fields, along country roads, in front of city residences, in parks and gardens; everywhere some, nowhere too many."

A correspondent of the *Statesman* thinks that Mr. Elliot's assertion that the ashes of cow-dung form as good a manure as the dung itself, is not altogether baseless:—"In the Western parts of the Beglair Talooka, Nasik Collectorate, where the rain-fall is excessive, the principal cereal grown is Nagli, the mode of cultivating which is the following. A square plot of ground is covered to a depth of three or more inches with cow or other dung. This is carefully burnt before being ploughed into the ground on which it lies, and which is used as a nursery to rear plants to be afterwards transplanted into the fields. Doubtless this mode of applying manure, *i. e.*, after first burning it, has proved itself to be the better one for the crop mentioned: otherwise we find the naturally indolent and pains-saving native putting himself to useless trouble."

Another adjunct, which the same correspondent thinks necessary to successful farming in the country is irrigation. In India the value of water can hardly be over-estimated, while places abound where it is easy to impound the water during the rains for the dry season. Not the least care is shewn for so preserving it. In the matter of the Bombay Municipality, the correspondent justly observes that "had the Shewla scheme been adopted by the Municipality instead of the lesser one of Toolsee, much of the interest of the loan for the construction of the work might have been paid by the sale of water. There would be an inexhaustible supply, and the land on either side of the aqueduct would become most valuable instead of remaining an unproductive waste."

The *Statesman* thinks that the following are the chief purposes for which model farms should be established in India:—

1st.—To promote a knowledge of rudimentary agricultural chemistry, to an extent that will enable the ryot to adapt his manures to the crops he requires. 2nd.—To introduce new products and improve existing ones, by the selection of seed, and inducing greater attention to cleanliness, drainage, and tillage. 3rd.—To improve the implements of agriculture in the country, *not necessarily by the introduction of English implements*, which frequently are totally unsuited to the soil, but by the introduction of English common sense, to adapt the implements which a native *can* use to his work, in such a manner that one man shall perform an amount of work which with the present "friction producers" it takes 5 or 6 to perform.

In concluding a recent report on Indian Quinine, Mr. Howard, the celebrated chemist, endeavours to dispel the fears entertained by cultivators that an excessive supply from India will glut the market, so as to cause prices to cease to be remunerative. As regards really good barks, Mr. Howard sees no reason for this fear. They will always repay well the expense bestowed on their cultivation. No medicine in the world can rival quinine in its efficacy and in its consumption. The South American forests cannot vie with skilfully cultivated plantations in India, for if nothing else, the very cost of transport would hinder this. An over-supply of the bark, is indeed a *possibility*, but the contingency is remote and need not be thought of at least by the present generation. The altitude at which cinchona can be profitably grown is at best extremely limited, and it will eventu-

ally be found that the really productive plantations are not very numerous.

All the world knows how famous the French are for mushrooms. Their cultivation is conducted with great art and on a large scale. The method of production is stated in the *Gardener's Chronicle* to be as follows:—"The spawn of the common mushroom is taken up with a moist camel-hair pencil, and laid on a damp strip of glass, so that it can be placed under a microscope, and the germination watched during its modification. When the mycelium, or *blanc de champignon*, as it is called, is developed, it is placed in highly manured earth, where the development continues; the finest specimens are afterwards selected and placed in a mushroom-bed in a cave or quarry, covered first with a bed of sand 10 inches deep, and over that a layer of old plaster, about 6 inches thick, the whole being watered, with the addition of a small quantity of nitrate of potash. At the end of five or six days very large mushrooms spring up clustered together in masses of delicious scent and flavour."

The following statement shows the imports and exports of grain and flour into and from the United Kingdom, viz., from last August to the close of May, compared with the corresponding period in the three previous seasons:—

Imports.

	1871-2.	1870-1	1869-70	1868-9
	cwts.	cwts.	cwts.	cwts.
Wheat	27,681,380	32,780,290	28,684,449	19,732,067
Barley	9,153,342	5,566,971	5,741,311	7,935,850
Oats	6,507,778	5,342,077	6,772,125	4,309,638
Peas	453,612	545,309	916,018	874,348
Beans	2,406,437	1,265,281	1,299,486	1,387,549
Indian Corn	12,744,316	10,119,898	13,245,990	9,511,669
Flour	2,936,967	3,180,274	4,467,675	2,809,520

Exports.

	1871-2.	1870-1.	1869-70.	1868-9
	cwts.	cwts.	cwts.	cwts.
Wheat	2,059,542	2,656,800	233,261	149,668
Barley	14,545	109,214	18,507	97,678
Oats	97,530	1,274,382	83,954	79,984
Peas	7,512	47,172	11,120	23,023
Beans	5,001	14,742	2,043	4,444
Indian Corn	20,617	57,270	14,044	895
Flour	48,777	1,300,495	16,833	23,742

The Delhi paper speaks of the manufacture of syrup from sweet potatoes of the yam variety. This vegetable is a climbing plant (*Batatas edulis*,) or the *Convolvulus batatas* of Linnæus, and its farinaceous tubers have a sweetish taste, and are used when cooked, for food. It is a native of the Malayan Peninsula, though cultivated extensively in other warm regions, as the shores of the Mediterranean, and in the Southern and Middle United States. It produces over two gallons of syrup to every bushel of sweet potatoes, and the residuum is a valuable edible. If a man can cultivate fifteen acres in potatoes, the yield averaging 200 bushels to the acre, the result of one man's labour is estimated at 6,000 gallons of syrup, which may be worth not less than 1 rupee per gallon, as the syrup will surpass the best in delicacy of flavour. It is also mentioned that the yield of syrup from sweet potatoes exceeds that from beet, and if so the sugar product from the potato should be proportionately greater.

With reference to an article that appeared sometime ago in the *Statesman* which we quoted in our last issue, on the absence of high farming in India through scarcity of manure, a correspondent of that journal expresses its surprise that no use is made of bones for the purpose in this country. "Bones which, whether in the form of dust or as superphosphate of lime, are a most enduring manure, are especially beneficial to cereals. In many of our districts, tons upon tons might be collected, as where the animals die the carcases are eaten by the birds and jackals and the bones remain. The amount that Bombay and other cities could furnish would be very large. In England not a bone is wasted, and bone-dust is worth from £10 to £12 per ton. It is only necessary to establish a manure manufactory where superphosphate of lime might be made, and the ordinary night-soil and refuse of a large town utilised, to provide sufficient manure for all the land at present under cultivation."

Mettray, says a contemporary, is the model farm where France sends her youthful criminals who are less criminal than unfortunate. The tax-payer with a jealous eye on this establishment, ascertains the juveniles to be not only employed, but employed advantageously. It is not a prison, with its inmates enclosed between walls; it is a model farm school. After debiting each cultivated acre with the value of the boy-labour bestowed thereon, the nett profit of the establishment for 1871, was, we are told, 30,000 francs, showing that these experiments can be made self-supporting. The Director of Mettray finds it more profitable to consume beet than send it to the distillery, and so the roots are cut, mixed with balls of wheat or oatmeal, a little salt is added, and the mass is allowed to ferment; and thus 150 head of cattle are rapidly fattened, the grain of the meat being found exceptionally excellent. As a fallow crop and an admirable preparation for wheat, kidney beans are extensively cultivated; while for the young lads there is a kitchen garden, which involves an expense of 640 francs per acre, the returns just covering the outlay.

The Umritsur correspondent of a contemporary says, that peaches, pumpkins, water-melons and plums are fruits which are now being produced there by the ton. He pays a great compliment to the peach. "You put it into your mouth, it melts away, and leaves only a small stone and a portion of almost imperceptible skin. You could not have peeled it before eating it." The writer adds:—"Wealthy merchants regard it as *the thing* for them to spend their riches on—the laying out of gardens. The amount of fruit grown near Umritsur is enormous, and must be a source of wealth to the garden owners. A good many of the investors are fruiterers, that is to say they buy a garden on speculation and make the most of it they can. I cannot say much for the melons. The flavour is good, but not very In the matter of pumpkins, I think, Umritsur stands very fair, so far as the size of the fruit is concerned. How the city keeps its health with the consumption of so many kinds of fruit and so much of each kind, I don't know. It seems that Indian fruit, eaten in season, never disagrees with people. Mangoes are just coming in here. It is a maxim with people careful of their stomachs—'Never eat a melon after the rains have set in, and never eat a mango till the rains have begun.'"

A good deal of confusion seems to exist on the subject of *Reh* and *Oosur* lands. It is strange, observes an authority on Indian Agriculture, that the *oosur* which is naturally barren soil, seldom containing saline substances should be mixed up with the *kallar* which is sterilized soil. The latter is produced by the over-irrigation of land previously fertile, and is incorrectly called *reh* which is quite another thing. *Oosur* which in Hindee and Sanscrit means naturally barren land, is quite distinct from lands unfit to produce grain and root crops, because of their being overcharged with common salt or other saline matters, two per cent. of which in the soil will prevent its growing wheat crops. This circumstance better explains the sterilizing powers of salt. *Oosur* very much resembles in composition the barren soil, and the more clay (alumina) it contains, the worse the soil, which to improve is out of the question. *Reh*, on the other hand, is soil impregnated with fossil carbonate of soda, and such earth is used for washing garments. The salt yields soda which the natives use in the manufacture of soap and inferior glass. It is a fertilizer, and may with advantage be used as a mineral manure, and the soil charged with it may be used as a top-dressing to grain crops. The difference, between these soils is really this, that the true *reh* soil is very fertile, the *oosur* hopelessly barren, while *kallar* means land which is barren and sterile from the presence of salt or other saline matters. As the subject is one of interest and public attention has been recently drawn to it, we produce the paper further on in our columns.

A contemporary tells us that both in France and Germany chemists are actively employed, not in discovering the composition of soils, but under what form the elements of the soil are assimilable by plants? M. Grandeau, the celebrated French agronomist, has attacked the problem by taking two specimens of soil, equally rich in mineral matters; the one black and very fertile, comes from Russia; the other is from France, and is only rich in proportion as it is manured. In the first specimen, the mineral matters exist in a form that the roots can at once assimilate, which is not the case with the second. The black coloring matter of soil number one, was carefully separated; it remained unaffected by chemical tests, and only when evaporated and the residue calcined, were mineral matters detected. Farmyard manure gave the same results as the black soil. This colored liquid, a sort of "chyle," contains the prepared, the cooked matter for vegetable nutrition, and circulates at once through the tissues, when organic substances in combination with mineral matters will not. In a word, organic matter is essential to work up the minerals into this "chyle," thus reconciling the humus theory of de Saussure, with the mineral axioms of Liebig. To complete our scientific news, Boussingault we are told, has delivered an interesting lecture on iron as an element in life. "I gathered, "says our informant," "from the old chemist's remarks, that there is as much iron in white blood—as in oysters and snails—as in red, and the coincidence is the same in the vegetable kingdom, green juice being no richer in iron than the white juice of the mushroom. As food, blood is the richest in assimilable iron, as the metal has been already assimilated, but the pig is the only animal, whose blood is not repulsive as an article of diet From a series of interesting experiments conducted at the agronomic station of Prilep, in Austria, applications of potash in the form of phosphate or carbonate, sensibly increased the yield of sugar—the former more markedly."

In an address lately delivered to the farmers of New Jersey, in the United States, the Hon. James W. Wall alluded to the enormous increase of late in the agricultural produce of England. Less than a century ago, the production of wheat in the country fell short of 16,000,000 bushels. In 1870, the yield exceeded 100,000,000, or an average of 30 bushels from every acre of land devoted to this staple. In pointing out the agencies by means of which the increase was brought about by English farmers, Mr. Wall said:—

"In the first place it is to be found in their systematic attention to all the requirements of good farming, in the skill and exactness with which all the operations of ploughing, harrowing, clod-crushing, burning, and scarifying are performed; in the perfect condition of "tilth" to which they bring the land preparatory to the reception of the seed; in their careful selection of the best varieties of seed wheat; in the extensive and prudent use of their barn-yard manure; in the perfection of all their instruments of tillage; in the strength and discipline of their draught animals; in the assiduity with which they extirpate every weed and remove every rock that can interfere with the cultivation of the land. Nothing is left to casualty or chance. No expectations are indulged that the bounty of Providence in an unusually favourable season will atone for their shortcomings or neglect. Everything which human foresight, scientific skill, intelligence, well-directed labour, and mechanical aid can accomplish is done, to ensure the highest yield from the land. It is next to be seen in the extraordinary liberty with which they restore to the earth, by means of purchased manures, all those elements of fertility which are exhausted in the process of cultivation. It is estimated by chemical analysis that wheat absorbs 40 of every 100 parts of nutriment contained in the soil. Now some idea of the enterprise of English culture may be formed (added Mr. Wall) when I state to you that in a single year, the year 1857, the first year of its general use as a fertilizer, the foreign bones imported were valued at the Custom House at 1,500,000 dollars, since which time it is estimated that the amount paid for imported bones alone amounted to 150,000,000 dollars. Since 1841 upwards of 1,500,000 tons of guano have been used."

Mr. Wall also spoke in high terms of the English system of drainage, and remarked that nothing more perfect in rural economy could be conceived than their rotation of root and grain crops. He believed the root cultivation to be the salvation of England, and said that the power of the British Empire rested upon her coal, her iron and her turnips.

MISCELLANEOUS NOTES.

The *Farmer* affirms that as a general rule white flowers are more fragrant than those of any other colour. Yellow comes next, then red, and lastly blue; after which and in the same order may be reckoned violet, green, orange, brown and black.

5 July.

The United States Agricultural journal notices the so-called "compass plant" (*Silphium laciniatum*) the plane of whose leaves is directed north and south so constantly, that the compass can readily be determined from their examination.

The rose seems to attain its greatest perfection in South India and Ceylon. A monster rose-tree now grows on the Oragalla estate in Ceylon, which is declared to be eighty feet in circumference, fifteen feet high and to be covered with at least two thousand roses.

The seeds of the Guarana, *Paullinia sorbilis* are, according to a Madras paper, attracting attention as a substitute for tea. The active principle is an alkaloid identical with that of tea which the Guarana seeds contain in double the quantity yielded by tea leaves.

Bismarck, says a contemporary, believes that he can manage a farm better than the German Empire. although Vardin, his Pomeranian farm with more cost yields less than any corresponding farm in the country. Cardinal Richelieu thought he shone better as a poet than statesman, although everybody pronounced his verses execrable.

The *Delhi Gazette* learns that in Tullugong in the Jelum district, a poisonous grass, *fuleps marcdin*, grows in the season of the *Khareef* harvest which the cattle in the absence of *bhoosa* or other fodder are induced to feed upon In consequence of this hundreds of cattle die every year. This fact accounts also for the sickness which we are told is more prevalent among them this year than in past time.

The Chinese have a peculiar method of preserving grapes. A hole is cut in a ripe pumpkin making the aperture large enough to admit the hand. In the inside, after being completely cleaned, the ripe grapes are placed, when the cover is replaced and pressed in firmly. The pumpkins are then kept in a cool place, and the grapes we are told retain their freshness for a year. The common field pumpkin is all that is wanted for the purpose.

On the principle of the machine used for filling sausages, is exhibited in the Crystal Palace and is used for "cramming" fowls for fattening them. It consists, says a contemporary, of a cylinder in which the prepared food is placed, terminated by a smooth flexible pipe of India rubber. The food is forced out at the end and into the crop of the fowl. By this invention, food is administered to 250 fowls in an hour.

The *Indian Daily News* gives its readers a receipt for obtaining "blanketed ecstacy." "Take sixteen Bombay mangoes, and wrap them up for two hours in a blanket containing a couple of seers of ice. Then eat them. Not the best *sherbet* sublimed with snow, nor Burgundy in all its sunset glow, can vie with that feed of iced-mangoes. We have heard claret cup defined as "jugged rapture;" in the same phraseology, a not inappropriate definition of iced-mangoes would be "blanketed ecstacy."

An American journal reports some interesting experiments to determine the comparative fecundity of poultry. Three ducks and three hens were selected for the purpose, all hatched in February and nourished with suitable food. In the following autumn, the ducks laid 225 eggs, while the hens laid none. In the next February, the laying season began with the ducks and continued till August. They shewed no inclination to set, but became very thin. The total number of eggs by the hens amounted to 287, while that by the ducks was 302. The eggs of the ducks though smaller were superior in nutritive material.

A contemporary notices a fine plant lately introduced into India:—"The novelty of the season in the horticultural world at Bangalore is the Amaranthus Salicifolius, an annual introduced from the Philippine Islands. It is of pyramidal form, from two to three feet high, branching close to the ground. The branches extend in a horizontal position, the leaves are beautifully undulated, and assume a bright orange red. Full grown specimens bear a very close resemblance in habit of growth to the well-known Croton Angustifolium. It is confidently believed that this unique Amaranthus will prove well suited to the climate."

A FARMER of the United States is preparing to accommodate 3,200 head of cattle under one roof. The building has a sixteen-sided centre with sixteen wings, each affording room for two hundred head of cattle, thus accommodating the whole number (3,200) in the sixteen wings:—"The centre building will afford room for a steam engine, corn sheller, mills for grinding, straw cutters, steam boxes, storing food, &c. Corn-cribs with hopper bottoms, will be placed between the wings, and the corn brought into the centre buildings by the engine with drag belt, and delivered to the corn sheller, the shelled corn being elevated to the story above, into a receiving bin, and drawn thence by a spout to the mill below for grinding, all being performed by the engine. A feeding car, filled from the steam box, will be run along the centre of each wing, and the cattle feed right and left from it."

IN examining the constituents of different kinds of milk, asses' milk has been ascertained to be the most diluted, containing scarcely 9 per cent. of solid matter. Next to this, is human milk with somewhat over 11 per cent., while mares' milk contains 17 per cent. The average is seen in the milk of the goat and of the cow. Human milk is reported to be poorest in casein and albumen containing only 4 per cent. of casein, while cows' milk contains 5 per cent. with one-half of albumen. Goats' milk containing 6 per cent. of casein has a larger amount of albumen than that of any other mammal. The smallest quantity of butter is found in asses' milk, while the milk of the goat contains the largest or nearly 7 per cent. Sheeps' milk is reckoned most nutritious containing 11 per cent. of protein matter. The milk of the cow has 4 per cent. of milk-sugar while that of the mare has 8 per cent. which renders it prone to fermentation, and the Tartars produce from it an intoxicating liquor known as quass.

A HOME paper draws attention to an evil very prevalent in the neighbourhood of the Potteries, and indeed common throughout the kingdom, viz., the excessive use of tea as a beverage. Amongst workmen, this drink, we are told is resorted to many times a day, in large and strong doses, often without sugar or milk, and generally accompanied by food of no nutritious character. The results are a derangement of the stomach with uterine disease. Dr. Arlidge says thereon: "I will take this opportunity of remarking upon the lamentable amount of sickness consequent upon the abuse of tea, by women of the working classes. Instead of using tea as an occasional beverage, they make it a principal article of diet, and drink it usually without milk or sugar several times a day. At most meals, bread-and-butter is the only solid accompaniment. In many cases doubtless, poverty imposes on them a meagre diet; but even in such the one alluded to might be advantageously replaced by other kinds of food not more expensive." Dr. Arlidge adds:—"Bitter and strong is the agitation at the present period against beer and other intoxicating liquors as the root of all evils; but in my opinion, there is room for agitation against tea-drinking as carried on in the way spoken of, for I am convinced that a deterioration of health among the working classes, and lower vitality in the rising generation, are consequences of the abuse of the beverage an question." A moderate and careful use of some pure cheap wine—such as claret, for instance, is more conducive to health and morality than 'teatotalism.'

AGRICULTURE IN EUROPE.

HINTS ON SEED SOWING.

WHEN and how to sow the various seeds in the garden are questions of some importance to people whose minds are mainly engaged on other matters, and for the benefit of such we now offer a few general remarks on the subject. In the Calendar published a fortnight ago we advised waiting, so as to have the soil in good condition, rather than risk the chance of failure by sowing in wet, cold earth, and would now urge with increased force the advantages in favour of waiting for a proper state of dryness in the soil before attempting to commit any seed to its bed. Large seeds, such as pease and beans, may in many cases, for the purpose of a close succession of crops always green and succulent, be sown at stated periods, or as near them as the weather will permit, without much danger to the future crop. These have great vital power, and resist more successfully the evil effects of lying long and germinating slowly in a cold, wet bed. Yet there is a decided limit to the endurance of such vigorous seeds. In stiff clay soil they often die out when sown in it wet early in the season. There is less risk of this fatal consequence when spring is well advanced, but there is often a considerable impairment of the vigour of the plants in the early stages of growth which makes itself felt in the quality and quantity of the crop, and the general tendency of the plants to mildew and other weakening disorders. But with a little watchfulness, there need be no necessity for exposing even these hardy seeds to the evils of being sown under unfavourable conditions, as regards the soil at least. In the most uncertain and variable seasons that occur in our proverbially uncertain climate, there may be found short interruptions to the general unpropitiousnes which by the watchful and energetic will be improved and taken the fullest advantage of. When such an interruption appears imminent every one interested in and desirous of making the most of their gardens should do all in their power to make good any arrears in seed sowing. It is a good practice to steep all seeds that may be so treated in water for twelve or twenty-four hours before sowing them: germination takes place more quickly when this is done, and very often lost time may be recovered by attention to this simple expedient. It is an easy matter steeping such large seeds as pease or beans by merely placing them in a dish of water, and the smaller ones may be enclosed in small bags of muslin or calico, and immersed in water. Generally speaking, the thinner the coating or skin of the seed the shorter the time it should be immersed in the water, and *vice versâ*, but twenty-four hours is ample time for any garden seed to be steeped before sowing. Small seeds will not be easily sown if they are not dried a little beforehand; this may be done by exposing them spread thinly on a cloth for an hour or so after they are taken out of the water. Thick seeding is a practice that should be avoided by all who wish to have the best success at the least cost and labour. Considerable labour and trouble in the operations of thinning and cleaning the crops are saved by sowing thinly, and not only that, but the crops come away with more strength and sturdiness, and are less liable to be affected by any adverse vicissitudes of weather that may occur. Drill-sowing, for similar reasons, is preferable to broad-cast sowing; the crops not only develope better but the necessary operations of cleaning and stirring are easier and more effectually performed; the hoe can be substituted for hand-weeding. There is a very common opinion that larger crops of such as the onion can be obtained by broadcast sowing than drill, but it is a fallacy which requires only to be tested fairly by experiment to show its groundlessness, and we would urge our readers who are sceptical to put the matter to the test by fairly trying a portion of their crops each way. The width between the drills must be regulated by the requirements of the crop as to space for development. Onions may be placed as near each other as 6 or 7 inches, but will be finer if they are allowed 9 or 10 inches; but they should not be placed closer than to admit of a small Dutch hoe being freely worked between the drills. Carrots of the large growing kinds should be allowed from 14 to 18 inches, beetroot about the same distance, and lettuce and other such like comparatively temporary crops from 9 to 12 inches apart. Even in sowing such things as cabbage and all that tribe that are to be transplanted from their seed beds, we prefer sowing in drills, especially when the labour of the place does not admit of their being temporarily pricked out in nursery lines preparatory to planting out in their permanent quarters. The plants always come away more sturdily, and may be raised with better roots when sown in lines, and these are the best guarantee of successfully establishing them. Drills of pease should never be sown closer to each other than their height in feet, thus, if the variety of pea grows 4 feet high, the same distance should be allowed between the drills. But with regard to this crop and beans, it is often better to allow twice or thrice that distance, and to plant or sow other crops between. Spinach in particular succeeds best in the summer months in such a position, because it derives some shelter from the scorching rays of the sun, and is therefore less liable to be forced early into flower and seed. Root crops, such as the carrot and beetroot should not be placed in such a position except the garden is an exposed and shelterless one, when they will be benefited by the shelter of the pea rows. Beans of the tall growing kinds should be treated on the same principle as pease, being separated by a distance equal to their fully developed height, or by twice or thrice that distance, the intermediate space when wide being planted with cabbage, cauliflower, leeks, or any of the other long standing crops, but dwarf-growing kinds may be sown as close as 18 or 20 inches.—*North British Agriculturist.*

AGRICULTURE IN INDIA.

LOW FARMING IN INDIA.

IT is well known that the natives if left to themselves do not go ahead. They are satisfied to go on in the way that their forefathers have gone without striking out a new path for themselves. It is only when they come in contact with Europeans that they can be galvanised into activity. In the towns they compete with the Englishman in trade, and, from

Government employment they try to oust him altogether. English education has had its effect upon a good many of the native community, and its money value is perfectly understood by them. The examination lists that come out every year clearly demonstrate this. But not so with the Indian ryot. His soil is bound to the soil, and it will take many years before enlightenment can be poured into it. As everybody knows, those who till the soil all the world over, are the most conservative; and if such is the case in Europe what must it be in India where the ryot was, under the former rulers of the country, little better than a beast of burden, and where nothing has been done to instruct him since he has come under British rule, so that he is in much the same state that he was hundreds of years ago, with the exception that he is not so much oppressed. He goes on ploughing the ground and twisting the tails of his bullocks in the same way that his forefathers did in the days when the ancestors of the present conquerors were picking acorns in the woods of Germany, or painting their bodies blue in the forests of England. He does not drive his plough one-eighth of an inch deeper into the ground than his forefathers did in the days we have mentioned; neither does he care to raise a larger crop from the land than they did. There may be found people enthusiastic enough to think that these people must be supremely happy, and that an Indian village must be Arcadia itself, and nothing less. But most people will be of a different opinion. It would be more correct to say that the ryot is too thoroughly sunk in sloth and darkness to be anything like happy.

To show the sloth of the ryot, we have only to see the way in which he cultivates the land. However rich the land may be that he holds, and however rich he might become if he only cultivated the land better, nothing can move him from the apathy into which he has sunk. He is so dull that he cannot see his own interests, or else he would make the best of the work he had in hand. He cares not so long as he can procure money enough to feed himself and his family, and to pay the rent to the Collector. Beyond this he never provides. Even for his expensive marriage ceremonies he rarely lays anything by, but goes straight to the village money-lender and borrows as much as he can, and thus in all probability lays himself under an obligation for life. But even the debt that he contracts, and the screw that is put on him by the village Shylock will not rouse his torpid energies to try and free himself. He will go on the same as before, and just manage to live from hand to mouth. He has to pay an enormous interest for the money that he borrows, but he will not try to pay it off, or perhaps he looks upon it as the right sort of thing to be in debt; for his father before him borrowed money from the soucar, and paid interest for it, and why should he not do the same? And he does as his father before him did.

We know from experience that what we have said applies to the ryots in every part of this Presidency, but assuredly this sloth and carelessness is not confined to this Presidency. It is found in every part of India. The ryot in Bengal or Bombay is not a more provident creature than his brother ryot in Madras. This is what is said of the Bombay cultivator by the *Indian Economist*:—"In the Deccan the small amount of labour that will keep the cultivators in comfortable circumstances throughout the year, and enable them to contract heavy debts for the marriages of their children, is almost incredible. Very little care is taken to be prepared against the advent of the rains, and occasionally the first fall, which ought to make the seed sprout, overtakes the people in the work of ploughing, and occasions a delay till the first break in the monsoon. Weeding also is much neglected, the fields being sown with an amount of unremoved grass and stalks of last year's crop which must materially affect the harvest. Even the cotton-fields, and the grain-fields near to large cities, present an appearance of neglect that indicates little concern to develop the resources of the soil; but when we come to inspect the state of cultivation in the neighbourhood of distant villages, where the principal crops are for the consumption of the present population, the indifference about any economy of the land, and the regardlessness to grow more than will come up almost in a state of nature, or even to protect the crops such as they are from the depredations of cattle, becomes very marked." This state of things is not encouraging certainly, but it points out one thing very clearly, and that is that the ryot has very easy times of it. He is not oppressed in any way. The Government however harshly it may treat some of its children is certainly paternal to the ryot; in fact, we think, it is a little too much so, and we are decidedly of opinion that more money might be taken from him without doing him any wrong. Suppose the Government were to make him pay more for his land than he now does, what would happen? He would have to cultivate it better than he does at present, and would have to work harder, which would certainly do him no harm, but on the contrary good. It might perhaps strike an idea into his head that if he were to work still harder he might be able to provide himself with more money, and thus be enabled to pay off his debts and live better than he does. It certainly requires something sharp to rouse the ryot from the lethargy of ages, and what can be sharper than an extra imposition of taxes? Besides, it is an injustice to the rest of the community to tax the ryot so lightly in order that he may indulge himself in laziness. He does not bear his fair share of the burdens of the state. A man in any other department of work has to pay for every step that he gets in the shape of income-tax, but the ryot is exempt from this tax, and pays, to our way of thinking, very little for his land.

We think the land-tax of this country ought to bring in a great deal more than it does. The whole land belongs to the Government, and yet the money that is received from it is not much, and all sorts of taxes have to be laid on in addition, culminating with the hated income-tax. The question that we cannot help asking is, is it not possible to get much more money out of the land than we do at present without oppressing the ryot? If more money can be taken without distressing him, the sooner some system is formed to take this money, the better it will be for the country at large. But there is another thing that the ryot requires, and that is education. We must instruct the man before we can expect any great change in his way of proceeding. If instead of spending lakhs on teaching English and building schools, we were to instruct the children of the ryots in their own tongue, we should do far more good, and in time we should have an ample return for our money. English education can take care of itself, but not so vernacular education. It has to be treated very tenderly, and encouraged in every way. In years to come perhaps it may be left to itself, but this will not be for a long time to come. It has not been fairly commenced yet, and when it will be in fair working order, it is hard to say. We are confident that a good vernacular education if given to the ryots and the lower classes of the country generally will pay well, and therefore, if for no higher reason, it ought to be established. The subject of the land and the ryot requires to be investigated, and when it is many strange things may be brought to light.—*Madras Times.*

RHEA MANUFACTURE.

Everyone seems to have forgotten poor Lord Mayo's first special experiment towards developing the industrial resources of India. We refer to the much trumpeted competition of machines for the extraction of Rhea fibre from the China or Kangra grass—which is not grass at all, but a tough and stately member of the defiant nettle family. Very defiant had this fibre proved; nothing but the patient fingers of multitudinous Chinamen had availed to make it serviceable. Many efforts had been made by mechanical geniuses to overcome its tenacity, and so far as is generally known, without success, until Lord Mayo resolved to "grasp his nettle" by the modern device of a handsome prize to be given to the inventor, who amongst all others should prove to have conquered the peculiar difficulties which beset the effort to separate this strong and glossy fibre from its mucilaginous coverings. The advertisement of the £5,000 prize has been published far and wide; offers were made to supply inventors with bundles of the grass for experiment; and many announcements have appeared regarding machines in preparation. April 1st was the date fixed for the trials of the several inventions; but, as we intimated some weeks back, nothing was then ready at Saharunpore except one or two of the machines, which had been taken there by the inventors at great trouble and expense. Even the place in which the trials were to be conducted was not ready, and the driving engine had still to be sent from the workshop at Roorkee. This does not reflect much credit on the Engineer officers concerned, or on their superiors, who ought to have put them in motion; and we quite imagine (though no one has whispered such a thing) that Mr. Allan Hume indulged in such strong language because of this unpardonable delay, which really almost amounted to a breach of faith with the intending competitors.

However, as we some time since mentioned, the motive power was at last set up, and a beginning of some kind was made. Whether there was any formal and duly authenticated opening of the competition, we do not yet know; but as we can make some definite statements as to results, it does not matter reversing the ordinary order of things. One of the most promising of the machines sent was that put in on behalf of Mr. Montgomery, the well known planter of the Kangra valley, who, we believe, has at various times prepared small quantities of the fibre for market. This machine was made by a good firm at home; but, unfortunately from some fault in construction or unfitness to deal with the plant in the bulk, the Montgomery machine had to stand confessed as a failure almost from the first. At least one machine from America made its appearance, but it did not prove a success; so it also, along with the Mont-

gomery machine, was withdrawn after some preliminary trials. Probably this was also the fate of two or three more machines which, like "dark horses," were kept back to the very last, though, as they were supposed in some way to be *en rapport* with all the store of enquiry that Roorkee can boast, that delay and their apparent failure now may serve to show that the battle is not always to the strong.

Be that as it may, the Indian public care little for the failures or chagrins of competitors; what they want to know is, whether there is a likelihood of Lord Mayo's handsome prize yielding a profitable return. If, in response to the offer, India obtains a machine which at a moderate cost will effectively prepare for market one of its best fibres, now comparatively useless, then a great success will have been gained alike by the inventor and the country. We begin to think that this is the case. On Thursday week (May 23rd) H. E. Lord Northbrook thought fit to deviate from his route to Simla and pay a flying visit to Saharunpore and the Botanical Gardens of that ilk. There he found at work the fibre machine of Mr. John Greig left, as we understand, in undisputed possession of the field, and proving itself a perfect success. His Excellency and Staff expressed themselves abundantly compensated for turning out of their way, when they witnessed the performance of this remarkably complete and powerful machine. The time when the China grass flourishes in succulent green stalks, has gone by, but Mr. Greig's machine takes no account of the toughness and dryness of the now brown withes. As fast as they can be fed into the machine—after the manner of our English threshing machine—the beautiful white fibre is turned out at the other end like a shower of silken skeins several feet in length. The difficulties to overcome in effecting the complete treatment, without intervention of manual labour, of this previously intractable grass, were very perplexing, and we cannot but think that the success of Mr. Greig's machine is a notable incident in the progress of mechanical adaptation. It is also highly satisfactory for us to remember here that this result has been aided by the foresight and persevering patronage of one of our Bombay native merchants, now deceased

The next object to be aimed at, is the growth of sufficient China grass to keep this fine and powerful machine at work; and, as we have aforetime pointed out, as obstacles to attaining that end, there are the two great difficulties of Indian agriculture—irrigation and manure. We should not feel so much interest in this machine if we did not suppose that some inexpensive adaptation of it will be available for the service of one or other of the coarser fibres which now grow wild and to waste all over India. There is a "scutcher," attached to Mr. Greig's machine, which can be worked either with or without it This was also shown at work during His Excellency's visit to Saharunpore; and we trust Lord Northbrook has not been so dazzled with the silken tresses of the fair Rhea, that he is likely to forget the claims the Cinderella who dwells among the aloes and agaves, the hemps of several kinds, the *moonj* and other tough sedges which now rot away on every river side. Can all these matters be safely left to the Agricultural Department? We fear that would lead to disappointment. The public native as well as European, must still help itself in these matters if any durable progress is to be made.—*Times of India.*

OUR BREAD.

It is a curious fact that the origin of the various grains which furnish our chief supplies of food is wrapt in mythological obscurity. Their introduction has been ascribed to special revelation. Brahma is said to have bestowed the gift of rice upon India; Isis taught the Egyptians to cultivate wheat; and Ceres introduced it into Italy. It does not appear that corn has ever been discovered growing wild; and it looks like a divine gift; but nevertheless it is only amongst civilised nations that the grain is be found; the region of the grains is the great arena of human civilization. There is no grain superior in character to wheat, and it holds as high a rank in relation to rice as the civilisation of the West holds to that of the East. The best bread has been given to the finest races of men, and in proportion as this race of men increases so will also the use of wheat and of wheaten bread. Wheat can be grown, wherever the mean temperature of the summer is above 55 or 60 degrees. Considering the great annual increase of the European population in India it is of some importance that the cultivation of this grain should receive more special attention, for very little attention seems to have been paid to the cultivation of wheat in our Presidency. The growth is limited to Mysore, and to the northern districts Buchanan says that wheat in this climate is liable to be blighted. Tippoo was at great pains to increase this kind of cultivation; and, as an encouragement, sent seed to be distributed in different places. The quantity might be much increased as the higher lands, although cultivated with rice, are fit for wheat. The produce varies from 13 to 26 bushels per acre. Some years ago Captain Dobbs of the Chittledroog division forwarded to Madras two samples of wheat, the produce of his taluck. They were grown on the black cotton soil common in that part of Mysore. The wheat was of very good quality but not equal to English grown wheat; which was hardly to be expected. Coimbatore produces a limited quantity of two kinds; one the product of the Neilgherries the other of the low country. In Captain Ouchterlony's memoir of the Neilgherries he calculates the quantity grown on the hills as 3000 bushels, being more than 22 garce; and also stated that the hills were capable of furnishing upwards of 400,000 quarters of wheat of a superior quality, and admitting of large profits to the grower. The Collector of Coimbatore, on the other hand, was of opinion that the district could never be made a wheat growing one. Salem produces wheat on its hilly portions, in soil composed of red earth, and the cultivators are Malialees. Cuddapah produces three kinds of wheat, but the district is not generally favourable to its growth, but as the rich black soils do produce wheat of a fair quality the culture might be greatly improved in those black soils which already produce wheat of a fair quality, if sufficient inducement were held out to the ryots to cultivate this grain in preference to other descriptions of produce. This is however the very difficulty that all suggestions for the improvement or extension of any agricultural product have to meet with. The small landholders have not the means to risk experiments, and with them a bird in the hand is always worth two in the bush; and the zemindars or large landholders have no patriotism to spare in such a course, quite content to send a few thousand rupees in an almost useless direction, so that they get talked of in the papers, or receive the empty and worthless compliment of the "thanks of Government." In Bellary it is said there are more than 14,000 acres fit for this cultivation, of which not 30 per cent. are made available. The causes are said to be the profit is not sufficiently large—the prevalence of a disease in the grain which occasions great loss—the straw is not made useful for forage—and the labour and time required in the cultivation being greater than attend other produce. In Guntoor also wheat crops are hazardous as compared with other crops, and consequently the ryots are shy of them. The States of Hyderabad and Berar seem to afford good facilities. The grain is certainly said to be by no means good; but this is ascribed to no fresh seed having been introduced into the Deccan, and the same land having been continually sown with the same seed the grain has deteriorated. It is reported that the cultivation of it could be increased to any extent along both banks of the Godavery, and at a cheap rate, with the advantage of this river for facility of transport. We believe that it is grown in the Madras Horticultural gardens, but the climate of Madras is said to be unfavorable. The Shevaroy Hills are said to be well adapted for it, the temperature being only 54° to 68° during the months of cultivation; and large quantities are grown there for local consumption. Rice can be no good substitute for wheat which forms *par excellence* the standard bread of the civilized world; it feeds the most enlightened, the most vigorous in body and intellect, and the most enterprising of the human race.

As this race is increasing in number in India, independent of the Army, it behoves Government to look into the matter, and to remember that a plentiful supply of bread and good roads are of greater importance than the multiplications of railways.—*Bangalore Spectator.*

Official Gazette.

BOMBAY, 22ND JULY 1872.

SEASON REPORTS, JUNE 1872.

General Remarks.—The event of the fortnight is the advent of the rains. From the westward the monsoon has broken over Bombay, the Central Provinces, and the Berars, but not liberally, and more rain anxiously expected. From the Bay of Bengal the rains have penetrated as far as Bareli. Bengal Proper and Behar had a plentiful downpour, but above Benares the fall seems to have been light and its distribution, judging from the report for Oudh, partial. The Panjáb has not yet felt the influence of the monsoon, but prospects in that province are hopeful. The Southern Presidency, with Mysore and Coorg, has had but slight rain (except at Masulipatam and Calicut, but the correctness of the rain-fall reported from the latter place seems open to doubt), and Orissa desires more than it has received. Everywhere preparations for the kharif sowings are being made; in many districts these sowings have begun.

Presidency or Province.	District.	Date of District Report	Rain-fall for fortnight preceding	Date of report from Local Government or Administration	State of Agricultural prospects.	Remarks of local Government or Administration.
Madras	Ganjam	June 19	...	June 20	Rain general, and freshes in the rivers; prices rising; grain imports decreasing, sowings commenced, cholera and fever present.	The general prospects are hopeful, but the monsoon is late and prices are rising.
	Vizagapatam	"			Partial rain, water supply still scant; market well supplied by imports; prices high but steady, cholera, small-pox and fever present.	
	Godavari	"			Light rain and river fresh, water scarce, cultivation commencing; markets well supplied, prices rising, small-pox present.	
	Masulipatam	"	3·0 nearly in the plains.		No rain in the uplands, cultivation commencing; markets well supplied; prices steady, health good.	
	Kurnool	"			Partial rain, cultivation commencing; markets well supplied; prices rising, fever and small pox present.	
	Nagapatam	"			Light rain and river freshes, crops in good order; markets well supplied; prices steady, small-pox present.	
	Trichinopoly	"	...		Light general rain; crops in good order, harvest outturn fair; markets fairly supplied, prices rising, health good.	
	Cuddapah	" 18	17·0 nearly ?		Cultivation in good progress, markets fairly supplied; prices rising, fever and small-pox present.	
Bombay and Sindh	Sindh	June 19		June 20	Heavy rains on the 17th in Karachi, sowing operations in Ghorabarra and Shahbandar talukas in Karachi stopped owing to fall of water in river. In Hyderabad Indus rising fast, 12 feet above zero, all canals full, cattle dying from starvation, cotton sowing going on, young plants observable in many places. Kharif fields being irrigated in upper frontier.	
	Gujerat	"	3·21 in Ahmedabad, 4·91 in Kaira, 3·80 in Broach, 1·91 in Surat, 1·64 in Nasik.			
	Deccan	"	3·75 in Poona, 1·74 in Satara, 1·98 in Ahmednagar, 0·78 in Sholapur		Sowing operation partially commenced in Poona, but delayed in Ahmednagar for want of rain.	
	Southern Maratha Country	"	2·15 in Belgaon, 1·43 in Kanagiri, 1·99 in Dharwar		Water scarce in Belgaon, sowing commenced in Kaladgi, but backward for want of rain, in Dharwar young crops withering. Prices of grain throughout nearly the same as before	
Bengal	Patna	June 19	4·77	June 20	Good rain, fields being ploughed for rice.	
	Dacca	"	8·75		Prospects of crops good	
	Burdwan	"			Favourable rain, rice mostly put into ground.	
	Cuttack	"	2·77		Sowings begun but backward	
North-Western Provinces	Benares		5·0	June 20	Commencement of rains at Benares, Allahabad, and Bareli, but not at Agra or Mirzapur, sowing commenced in Benares	
	Allahabad		2·80			
	Bareli		1·50			
Punjab	Delhi	June 19	1·50	June 2.	Cholera raging on in Balabgarh, rabi crops gathered in, weather warm and wet rabi	
	Ambala	"	[illegible]		Agricultural prospects good.	
	Jalandhar	"	Nil.			
	Lahore	"	Nil		Rain wanted daily	

Presidency or Province.	District.	Date of District Report.	Rain-fall for fortnight ending.	Date of report from Local Government or Administration.	State of Agricultural prospects	Remarks of local Government or Administration.
Panjab.—*continued.*	Multan	"	*Nil*		Rabi harvest gathered; preparations for kharif.	
	Rawal Pindi	"	0·50		Agricultural prospects good.	
	Peshawar	"	0·10		Rabi reaped; kharif sowings commenced.	
Oudh	Lucknow	June 19	*Nil*	June 21	There has been heavy rain to the north of the province where ploughing has commenced: to the south and east only showers. Heavy rain on morning of 21st, and prospect of more.	
	Faizabad	"	1·30			
Central Provinces	Nagpur	June 19	4·60	June 20	Land preparing for kharif; sowings will begin next week; prices of grain have slightly risen.	
	Wurdha		1·13		Ploughing progressing actively.	
	Raipur	June 15	0·30			
	Bilaspur		0·96		Preparations for kharif progressing generally.	
	Sambalpur		0·35			
	Jabulpur	" 19	0·35		Land being prepared for kharif sowings.	
	Hoshangabad	" 20	0·70		More rain wanted: ground ready for kharif sowings.	
	Nimar		0·27			
	Narsinghpur		3·50		Prices of grain rising.	
Hailarabad Assigned District	East Berar			June 20	Monsoon burst on the 15th: rain on that and the subsequent day one inch and ninety-five cents; rain general; break since 17th; sowing operations will commence after next fall.	
	West Berar	June 19		June 20	Rainfall from one to two inches very general throughout the division; sowing operations have been commenced.	
Rajputana	Alwar			June 20	No further reports. Showers in Kota, Tonk, and Jhalawar good.	
	Serohi and Marwar					
	Harauti and Tonk					
	Dioli		1·60			
	Meywar	June 8			Heat excessive; rain-fall in the plains one-sixth.	
	Jaipur	" 20	0·50		Crops, where sown, promising.	
	Ajmir	"			Intense heat; a few storms from north-east; grain dearer	
	Mhairwara				Relief works in progress.	
Central India	Indor	June 19	2·80	June 20		
	Gwalior				No change since last report.	No sickness in Central India. The heat during the first fortnight of this month has been unprecedented.
	Nimach		1·36			
	Ratlam		2·22		Grain market steady.	Rain-fall generally below the average.
	Baghelkhand		0·05 at Satna.			
Mysor and Coorg	Bangalor	June 20	0·79 in Bangalore Cantonment.	June 20	Very little rain: crops recently sown are thriving ryots are everywhere ploughing up their lands and sowing grain; &c.	
	Mysor	" 18	1·56		Crops thriving.	
	Coorg	" 20	6·03		Ploughing of rice-fields resumed: transplanting commenced throughout the province; prospects of ragi crops and coffee plantations generally good.	

The Foresters' Gazette.

BOMBAY, 22ND JULY 1872.

INDIAN FORESTS.

RESOLUTION BY THE GOVERNMENT OF INDIA.

The attention of the Governor General in Council having been called to the evils likely to result from the indiscriminate destruction of fruit and forest trees in many of the agricultural districts of India, the several Local Governments and Administrations were invited to consider the question and report on the extent to which this destruction had been carried, within their several jurisdictions, and on the remedial measures already adopted, or which they considered it desirable to adopt. The following paragraphs briefly summarise the information received by the Government of India on this important subject.

The Government of the Panjáb is unable to state the extent to which destruction of trees has been taking place; but looking to the great increase in the population, the high rates of fuel, the enormously extended area of cultivation, and the introduction of railways, is convinced that the demand for wood for fuel and other purposes has been so great that the destruction of trees must be far in excess of any new supply through planting operations. As regards remedial measures, the Panjáb Government attaches great importance to the subject of district arboriculture, both on a large scale by the Forest Department, in extensive plantations, and by the local authorities generally, and trusts that by careful management and by enforcing a scientific and uniform procedure, a great deal may, in the course of the next few years, be accomplished. In a report on district arboriculture, submitted by the Officiating Conservator of Forests, it is suggested that the agencies by which the gradual planting of districts might be accomplished are—By the people themselves under simple encouragement, compulsion or compensation by law, (including conditions in grants, &c.); by district officers; by Public Works and Railway officers; by the Forest Department. The first plan, when attempted, has generally failed, but in the Ludhiana district it is said that 816 villages have plantations made voluntarily. The Financial Commissioner has called for a report from this district, on the system in force there of encouraging villagers to form plantations, and has called the attention of the Settlement Commissioner and Settlement Officers to the great opportunities which occur while settlement operations are in progress for promoting arboriculture. In the Jhelum district about 266 acres are said to have been planted in the same way. On the suggestion of the Conservator, the Panjáb Government proposes to make an inquiry in each district as to how far the orders of the Board of Administration, regarding the free grant of plots of land for the plantation of groves have been carried out, and whether many applications have been made for such grants. It is suggested by the Conservator that in the new Forest Act a power should be reserved to the Local Governments to protect village groves and trees in fields, either by prohibiting their felling altogether, or by making it conditional on replanting, or by fixing a scale of rates; this power to be exercised in such districts as the Lieutenant-Governor might deem necessary, where destruction was threatened. The Conservator further raises the question as to the right of Government to appropriate and plant newly-formed alluvial lands, and the Lieutenant-Governor attaches great importance to the acquisition of large tracts of land suitable for planting purposes. The result of the orders given by the Board of Administration for the planting of trees round every description of Government building, has not been very satisfactory, only 17,119 acres having been planted. The Conservator suggests that complete returns, showing the details of plantation, such as the kind of trees, the length of road planted, &c., should be obtained from each of the different authorities which plant, and offers numerous and important suggestions as to district arboriculture generally, planting and selection of nurseries, watering and transplanting the species of trees suitable for the several varieties of soil, fencing and grafting. These suggestions are approved by the Local Government which proposes to call for the returns from the several Departments concerned, and to circulate to the district officers and municipalities the remarks about arboriculture. It is proposed to lay down a definite yearly scheme for planting operations in each district, as suggested by the Conservator. The Canal Department has been addressed, both by the Financial Commissioner and the Panjáb Government, on the subject of tree planting in the immediate neighbourhood of canals. For planting on the railway something has been done, but very little; and it is recommended that some definite system of operations for planting every line of road under the charge of the Public Works Department should be laid down. The Forest Department has one large plantation capable of extension to nearly 18,000 acres, and which will yield ultimately eight lakhs of maunds of fuel a year, and others of tolerable extent, so that at present there is more than ample work for the planting staff employed.

N. W. Provinces.—The Local Government says that wood undoubtedly is being cut down in greater proportion than it is planted, and that while wood-fuel was used by the Lahore and Delhi Railways, the result was a very considerable acceleration of this process. Brick-burning operations on the new railways also materially aid in the injury done. As regards the remedial measures that have been adopted, it appears that on the Eastern Jumna Canal a small plantation has been formed by the Irrigation Department at Kulíes, and that Rs. [illegible] have been spent in the Northern and Meerut Divisions of the Ganges Canal, in increasing the sowing of seed for the supply of fuel to the Panjab Railway. The remedy proposed is the formation of additional plantations on the course of the Eastern Jumna Canal and on the line of the Ganges Canal.

Oudh.—In Oudh the presentarea under groves is considerably greater than at the time of settlement, the destruction along the lines of railway being compensated for by extension in other places. The Conservator of Forests states that some of the lands of grantees in the Gonda district, about twelve miles north of Faizabad, are being rapidly denuded of wood, which is sold as fuel to the railways and to brick-making contractors. It is believed, however, that these grants contain no valuable sal timber; and even if they did, the grantees could not, under the terms of their grants, be prevented from cutting it. The remedies employed have been the exemption of all groves from assessment up to 10 per cent. of the total area of the village, and it has been the practice also to notify that—Land exempted from assessment on account of being under grove, shall be liable to immediate assessment, if the grove is cut down and another is not planted at the same time. Whenever land, which has been assessed, has been planted with trees or firewood, such land shall be exempted from revenue up to limit of 10 per cent. upon the cultivated area of the village.

Central Provinces.—In the Central Provinces no special destruction is going on in agricultural tracts or village lands. The circumstances of these provinces are peculiar. They extend over a large area, of which only about one-fourth is under cultivation. The population is scanty beyond that of any other provinces in India, and the demand for fuel is therefore not so great as elsewhere, while the means for meeting the demand are more ample. A certain amount of waste land has been added to village areas, and the remainder has been reserved as Government property. Most of this waste land which is covered with jungle is available to the people for the supply of their wants in the way of small timber for agricultural purposes, fuel, &c. They obtain their supplies under certain restrictions, and the wastes are under the management of the Deputy Commissioner. Year by year more attention is being paid to these wastes, and their importance and value are now generally recognized. Measures have been taken by the Local Administration to prevent, for the future, any excessive cutting and removal of timber from these lands; and in the settlement, with malguzars and proprietors of village and private lands, due provision has been made for the adoption of the established principles of forest conservancy in regard to the timber on their land. In bare and treeless districts, landholders and others have been offered rent-free grants of land, under certain rules, as an inducement to plant trees, but with no particular result. The remedies proposed are fixity of tenure and a good example in the careful tending of Government forest areas, fuel reserves, and waste lands.

Bengal.—In Bengal, the only districts in which it appears that any indiscriminate destruction has taken place, are Orissa, Sáran, and Shahabad, but the districts of Patna, Gaya, Hazaribagh, Múrshedabad, Bhágalpur, and Monghir have, to some extent, been denuded of trees. In *Orissa*, partly owing to extended cultivation and enhanced value of land, and partly to the demand for timber for burning bricks by the Public Works Department, numbers of old mango-topes and fine groves of trees are being destroyed to meet the demand for fuel. In Sáran, a very steady destruction of trees is taking place. In Shahabad, extensive felling is carried on by the Soane Irrigation Department for brick-burning purposes. In Patna, timber used to be unsparingly felled for railway purposes, and consequently many orchards were destroyed, but very many trees have been replaced since by new plantations. In the southern and eastern parts of this district, where fuel is very scarce, trees are still cut down. Mango-groves, when the trees have become past fruit-bearing, are not unfrequently removed by zemindars for the purpose of bringing the land under cultivation. But the indiscriminate felling of mango-topes is now of much rarer occurrence than formerly. In Gaya and Hazaribagh, mango-topes and other trees are often cut down to meet the demands of the Public Works Department. In

Murshedabad, where there is a large demand for fuel on account of silk filatures, valuable fruit-bearing trees are cut down; but the destruction is not indiscriminate, and mango-trees are carefully preserved. In the Bhagalpur and Monghir districts, mango topes are cut down to a certain extent for fuel, but the loss is compensated for by fresh planting. The remedial measures proposed by district officers are —

That a law be passed empowering the Government to restrain proprietors from felling trees and to make it illegal for any man to cut down a valuable fruit-tree without planting three young trees in or near its place.

That the Public Works Department be forbidden the use of large timber as fuel for brick burning, and that the use of coal by that Department and private individuals be encouraged.

That Government should take up waste and unculturable lands from private proprietors and plant them with trees.

That zamindars and others should be encouraged to plant gardens, especially "dhurmbaghs," or gardens consecrated to religious purposes, or planted *pro bono publico*; these to be registered in the Collector's office, with a view to prevent their future destruction.

The Lieutenant-Governor does not recommend any legislative enactment, but he would cause the proposal for using coal in place of wood-fuel to be carefully considered in the Public Works Department, and, if necessary, he would have experiments made.

Hyderabad.—In the Hyderabad Assigned Districts, the destruction of timber has been so extensive as to have led to the almost universal adoption of cow-dung fuel. It is proposed to start plantations in various parts of the Berars and to encourage the private cultivation of timber by the offer of reductions or remissions of revenue and lands taken up for the purpose of timber plantations.

Mysore.—In Mysore there are two classes of forests, not being private property, *viz.*—(1), State forests under the control of the Forest Department, and (2), district forests and fuel tracts under the revenue authorities. The State forests are strictly conserved and protected under the rules of the Forest Department, while the district forests and fuel tracts have been practically abandoned to ryots, fuel-dealers, and others who may take out licenses to fell timber or choose to cut fuel without the payment of any fee. These tracts have in consequence been considerably over-worked, especially during the past two years, in consequence of the growing demand for wood of all kinds for building purposes and for fuel. Indiscriminate and excessive felling is being carried on in the great majority of the Mysore forests which are under the control of the revenue authorities. This is the result mainly of the bad license system now in force, and the absence of a proper conservancy establishment under the revenue authorities. The remedial measures that have been adopted are the imposition of a tax in certain districts on the cutting of fire-wood, and the grant of power to Deputy Superintendents to close any of the district forests to the general public. The result, however, has not been successful. The remedies proposed are —

The reservation of all the more important district forests and fuel tracts throughout the province, and their systematic working by Government agency under the Forest instead of the Revenue Department as at present.

The abolition of the license system.

The establishment of a number of small depôts whence wood will be sold to all alike.

That felling in each forest be regulated according to its condition; that all charcoal-burners be registered and compelled to adopt a rational method of burning charcoal; and that planting operations be extended and the growth of sandal-wood fostered.

Kherg.—In Kherg there is no reason to fear any dearth of fuel, nor is there, with certain exceptions, any excessive or wasteful felling of forest.

Madras.—In this Presidency the indiscriminate destruction of trees has long been arrested as far as possible.

Bombay.—In the Northern Division, a considerable diminution in the stock of trees has taken place of late years in many of the districts. The destruction in the agricultural districts of the plain is ascribable to the removal of all restrictions affecting the cutting of trees, and vesting the property in them unreservedly in the occupants of the land, at a time when the price of wood happened to be unusually high, and to the demands for railways and for steam factories. But in the ghâts the clearance of wood is due more to the extension of cultivation involving the clearance of waste-tracts than to the high price of wood, the effect of the latter cause being confined to parts easily accessible to large markets. The Revenue Commissioner suggests that Government should assert its right to trees (of kinds peculiar to each part of a district) growing on all Government lands, which have not been already sold by auction; that rewards should be offered annually to patels who plant and preserve the greatest number of trees; that a sanad should issue under the signature of the Collector, renouncing on the part of Government, for all future time, all claims to the trees or their fruit, with a view to make the people take an interest in growing and preserving them; that trees should be planted on the sides of all made roads, and, when possible, on the sides of all cross country roads; that in places where there are steam factories, a sufficiently heavy tax should be laid on firewood to discourage its use and to make the substitution of charcoal cheaper. In the Southern Division the destruction of trees in past years was great, but the Conservator states that whatever destruction of trees now takes place in the Canara, Bilgaon, and Dharwar Collectorates, is confined to that portion of them where the forests border on, and get mixed with, the cultivated districts. The destruction is attributable partly to the spread of cultivation, but mostly to the high price of fuel. The remedies he proposes are that, on application being made by a ryot for permission to cultivate land with trees on it, on which the assessment has been fixed, he be required to give security that he will pay the assessment on it for at least 10 years; that no land with trees on it shall be given up until it has been examined by a Forest Officer, who should have power to reserve it altogether for forest purposes, or to remove or value the timber before the lot is put up for sale, the wood being credited to the Forest Department, instead of to Revenue as at present. The Survey Commissioner recommends a policy of entire non-interference with agriculturists. He suggests that when suitable spots of ground, measuring 10 to 15 acres, are procurable in treeless districts, plantations should be formed of the tree which thrives best in the selected soil; that all roadsides should be planted; and that the sides of those lying in cotton or black soil should be planted with babul. In tracts of country already wooded, the principal resource and mainstay of all conservation must be an entire stoppage of cutting by private parties on permits, and a sole resort to departmental cutting and collection of the wood in conveniently situated depôts. The Revenue Commissioner says that very careful and persistent attention has of late years been paid to the planting and preservation of trees on roadsides, and he suggests that the ghât slopes of the Ratnágiri Collectorate throughout their entire length be taken up and specially reserved, and that many spurs and hills, which now are comparatively useless to the cultivators be planted with trees. He thinks special legislation to obtain land for the purpose, and to check the exportation of private wood by the levy of an export duty, is needed. In Sindh, no indiscriminate destruction appears to have taken place. On the contrary, district officers pay great attention to the subject of arboriculture; there is no fear whatever of a falling off in the supply of wood for fuel in that province. The Conservator of Forests recommends the discouragement of exportation of wood felled on private holdings, by rendering it unprofitable by the levy of a fee. The Government of Bombay has issued stringent instructions to the district officers for the prevention of indiscriminate destruction wherever it exists.

British Burma.—The Chief Commissioner at present does not desire to interfere with the destruction of trees for fuel. The population of this province is so very sparse, compared with the enormous tracts of forest available for fuel, that there is no reason to apprehend any evil results from the destruction of trees. He is, however, of opinion that the destruction of cutch or catechu trees should be restricted, and the question of bringing these trees under the forest conservancy rules has already been under consideration in the Forest Department. Lamentable as is the destruction of trees that appears to have occurred, and to be still in progress in isolated localities, the evil does not appear to have as yet assumed, regarding the empire as a whole, such formidable dimensions as was at one time anticipated. Moreover, His Excellency in Council is gratified to perceive that the authorities everywhere fully appreciate the magnitude and importance of the subject, and that in several provinces judicious measures have already been adopted to mitigate or repress the evil. Under these circumstances, and especially having regard to the necessity of carefully adapting each measure designed for the protection of trees, and the promotion of their culture to the particular locality for which it is intended, His Excellency the Governor General in Council is of opinion that no further action on the part of the Government of India is at present called for, and that the initiation of such further remedial measures, as the present or future inquiries may prove to be desirable, may safely be left to the several Local Governments and Administrations.

THE FOREST TREES OF HINDOSTAN.

FOREMOST among the crowd of leafy princes in ornamental beauty and commercial value stands the ironwood tree of the Burrampooter valley, *Mesua Ferrea*. Tall, straight, and symmetrical, it rears itself some sixty or seventy feet high, tapering upwards in its glossy green mass of waxlike foliage, beset with

snowy, fragrant, golden centred flowers of the camellia character' its timber unmatched for weight and hardness by any other in all the immense wildernesses of Ind, and its worth enhanced by its comparative rarity, for the axe has played sad havoc with the very partially scattered groups to be met with at the present time. The dried flowers are sold as a perfume. There are certain conditions of soil, clime, and natural production which have hitherto baffled the zealous arboriculturist in his labours to propagate this beautiful wonder of the woods. A rival in beauty and utility, though quite of another type, appears in profuse array—the gorgeous *Lagerstræmia Regina*. Every spike of rose-red flowers enough to fill a market basket Grand in its regal bloom and stout in its growth, yielding durable though crooked logs, preferred by the Burmese for ship's "knees," and by the cute Anglo-Indian adventurer for the roof supports of his residence, this lovely tree attains a moderate size in cultivation, and flowers annually in the gardens of Lower Bengal. On entering Central and Lower Assam, the European stranger is overpowered with admiration of the gigantic woodland scenery. As he ascends the noble Burrampooter, winding among ranges of little hills and grand mountains, he will with his telescope scan the interminable tracts of dark forest, and occasionally define its constituent "Sylva." Spreading over the lower country, his glass will, from the poop of the steamer, proclaim that here *Shorea robusta* is indigenous and paramount, its sombre and silent shade telling the well-known tale of death-dealing malaria, which has laid low many a bold hunter and brave botanist in the regions of heat and moisture; the combination so necessary to the life of this valuable timber tree, attaining its proudest dimensions here and in the equally noxious atmosphere of the Nepaul Terai. The Government gun-carriages, the transport train, the military buildings, the warehouse of the merchant, the craft of the native boat-builder, all constructed of the heavy fibrous wood, supporting great strain and shock, while so heavy as to sink in water, and hence requiring rafts of bamboo and earthen pots to give it floatage in conveyance by river. Were it not for the annual conflagrations caused by the primitive custom of burning the old grass lands, India would at the present time have been indeed overstocked with this invaluable tree. The grain of the wood is much like that of our English elm. The railways have availed themselves largely of its comparative abundance and good qualities, and the Government conservators are keeping a strict eye upon the herdsmen and other incendiary tramps to save the young seedlings (self-sown) from annihilation. This is not the only precious individual in that remarkable order, *Dipterocarpaceæ*, for *Vateria Indica* supplies that elegant resin known to commerce as "East Indian Copal," closely resembling amber, and often containing flies and other minute natural objects. Combined with boiling linseed oil and a little pale dammer, it is in general use by carriage and house painters in the East as a varnish; while among the aborigines of Malabar it is manufactured into candles, which burn with a clear light, no smoke and fragrant odour. This gum resin is highly electrical *Vateria lanceifolia* yields the incense used in Hindoo temples near the coast. *Dipterocarpus lævis* and *angustifolius* furnish the balsamic oil known as gurjun. An old tree will supply, by tapping and charring, 40 gallons in one season, but will soon perish; for this reason the product is rapidly rising in price. The virgin forests of our north-east frontier, and also Burmah, are its localities, growing in the most dark and pestiferous jungles. Cedrela species are superb timber producers, yielding the finest woods for cabinet work, the darker kinds being almost equal to mahogany, and taking an exquisite polish. The older the timber, the finer the grain and the darker the veins. This is the favourite wood of the cabinet makers and house carpenters of the luxurious East. Such furniture as bedsteads, dining tables, chairs of every shape, sofas, cabinets, chests of drawers, &c., are to be daily seen in all the splendour of French polish, and of the latest European design; it is generally known as "Toon wood," and is very remarkable for its lightness, being only a little more heavy than deal, unless of the scarce mountain species, when its density increases, as its beauty also. This latter kind is rather rare in commerce, though so plentiful in the virgin forest of the upper Burrampooter districts; the reason being that no local saw mills have yet been started, and the rapids are too heavy to raft such fragile logs; indeed, there are few woods that can withstand the terrible grinding force of these vast cataracts, which not only smash gigantic trees into drift wood, but more frequently impound them for ever in some unapproachable cavern, beneath the waves. In the vicinity of the great north-east rivers, the Upper Burrampooter, the Dehong and Dehong (the latter supposed to be the veritable *Sampo* of Tartary), the nomadic tribes have long ago felled and cut out into canoes all the specimens of this valuable tree, not only for their own use but for barter with strangers and frontier traders in salt and cloth, their two chief desiderata.

In this valuable order of timber trees we have the satinwood of Southern India and Ceylon, yielding also a useful oil for painters; also *Swietenia Mahogani*, or mahogany tree, long introduced and partially acclimated; in fact, the first instance of this exotic seeding has just occurred at Madras. The cyclone in '64 or '65 destroyed one or more noble specimens in the Calcutta Botanic Gardens (said to have been planted by the founder of the establishment, General Kidd, a century before).

There are still a few experimental trees at Berhampoor, planted in low alluvial ground, where they do not appear to make any growth. Then we have the fine *Cinchrangia Tabularis* in this family, scattered over the more rainy of our climates, for it is a moisture-loving tree, in large demand by the Calcutta upholsterers and cabinet makers, being beautifully veined.

All this order contain a great amount of febrifugal property in their bark, their habitat being the most feverish localities; like the cinchona and the willow, both furnishing the potent alkalines quinine and salicine.—*British Trade Journal.*

HINTS ON FORESTRY.

The suggestion made by a correspondent of the *Agricultural Gazette of India* lately, that people applying for fresh lands on the Neilgherry hills should have them granted on the condition of planting a certain proportion of Australian trees, should be pressed upon the local authorities as also the Government of Madras. It is pretty evident that the Forest Department attach more importance to the Australian than to the indigenous forest on the hills, as they have just cut and burnt a sholah of some forty acres in extent for the purpose of planting eucalypti. This apparently strange freak has taken place at Coonoor. Why existing forest should be thus sacrificed it is hard to tell, as most if not all of the noble avenues and coppices in and around Outacamund have been formed on grass soil, and we think that this system of destroying one forest simply for the purpose of planting another should at once be stopped. If the Department is so anxious to cover the hills with sholahs let its officers confine their operations to grass lands. They will find ample scope for their energies, only it should be borne in mind that if the whole of the Neilgherries are converted into one immense forest, the result will be a rainfall approximating that of Belisle in the West Indies, or Cherrapoonjee in the Cossyah Hills. The former enjoys a shower bath of from 400 to 500 inches annually, while the latter is deluged to the extent of 700. According to the present method of working, the Department can show on paper that they do things cheaper than other people, as a man contracts to clear and plant a certain amount of land, recouping himself by the sale of the wood, and in the instance mentioned above the contractor has made an exceedingly profitable bargain.

Land in the vicinity of the stations might be left to intending settlers, while the Department—if they wish to plant—should by way of experiment, connect the present isolated primeval sholahs out on the Khoondahs by belts of Australians. True, a residence so far from Ooty would not be pleasant, but there are lands out in that direction that are far better fitted for the growth of timber than any in the vicinity of either Coonoor or Ootacamund, although people intending settling on the higher ranges would be somewhat restricted in the choice of timber for planting. Lower down, at an elevation of from 500 to 2,000 feet, the number of soft wood, quick-growing trees, suitable for such localities, is almost unlimited. Jack, mango, simmul, casarina for planking and firewood would in twenty years be a source of no inconsiderable wealth, while the areca and other palms might replace the present unprofitable scrub that encumbers the ground in the vicinity of the site of the new railway terminus at Mettapollium and for many miles along the N. E. base of the hills. Ere such desirable changes can take place, the adoption of a more liberal policy with regard to the granting of waste land is necessary. The Madras Government might behave in the same manner as that of Bengal, and, by throwing open its tracts of jungles with certain restrictions (not, however, to be framed exclusively by crotchetty officers in the Forest Department) convert their huge game preserves into healthy revenue-yeilding country, by substituting the planting of forest trees. In view of exacting quit-rent from lands that have been purchased, the Government of Madras would ensure a supply of firewood, and the rain-fall for the future, and get rid of an irritating impost unknown in any other part of India.—*Indian Statesman.*

REH AND OOSUR.

REH LANDS.

ANALYSIS OF SPECIMENS OF SOIL FROM REH LANDS ON THE WESTERN JUMNA CANAL.

From COLONEL R. STRACHEY, R. E., *Secretary to the Government of India, Public Works Department, to the Secretary to the Government of the Punjab in the Public Works Department.—No.* 14-79 *C., dated* 6*th January*, 1865.

REFERRING to your No. 224 C., dated the 8th June last, I am directed to inform you that the three boxes containing specimens of soil and of water from the Western Jumna Canal and reh land

in its vicinity, were duly received; but they had been packed so badly as to cause much loss of the specimens of water and some of the bags of soil.

The accompanying abstract of the original list of specimens will show what have been received and what have been destroyed.

It is to be regretted that more care was not taken in packing the specimens, but it will not be possible to remedy the matter now, and the best practicable result must be sought from the specimens that remain.

A more full description of the character of the land from which the soil was taken was also to have been desired, and so far as this defect can now be remedied it should be done. A precise statement of the condition of the surface should have been given; whether the salts effloresced or not; whether all vegetation was destroyed or not; whether the soil was saturated with water; if trees or shrubs grew on the land, it should be said what they were; whether the *reh* was of recent origin, and apparently caused by the canal or not; and so forth, giving the fullest particulars on all points.

Abstract List of Soil and Water taken from Reh Lands on Western Jumna Canals.

Localities.	Water.	Soil at Depth of			
Between Phoorlak & Moonuk—	No.	Surface.	2 feet.	4 feet.	6 feet.
		No.	No.	No.	No.
Canal water...	1				
Pit No. 1, 40 feet from canal bank (*reh* soil) ...	2 Water at surface	1	2	..	4
Pit No. 2, 2,500 ditto ...	3 ,, 6 ft. below	5	6	7	8
,, ,, 3, 5,000 ditto ..	4 ,, 6 ,,	9	10	11	12
Well, about a mile from canal	5 ,, 10 ,,				
Near Wysur—					
Canal water (rajbuha or water-course)	6				
Pit No. 1, close to rajbuha (*reh* soil)	—Water at 6½ feet.	13	14	15	16
,, ,, 2, 2,000 ft. from do	—Dry at 6 feet.	17	18	19	20
,, ,, 3, 4,000 ft. do.	7 Water at 6½ feet	21	22	23	24
Village well	8				

Bhutgong—	No.	Surface.	1 foot.	3 feet.	6 feet.
		No.	No.	No.	No.
Canal water...	9				
Pit No. 1, 30 feet from canal bank (*reh* soil) ...	.....	25	26	27	28
Pit No. 2, about a mile distant from canal (*reh* soil)	.....	29	30	31	32
Well, 10 ft. from the above	10 Depth to water not stated.				
Pit No. 3, about 1½ mile from canal (cultivated land)	.....	33	34	35	36
Pit No. 4, about 2 miles from canal (*reh* soil producing "*keekur* trees—*Acacia Modesta*)	.....	37	38	39	40
Pit No. 5 about 3 miles from canal (cultivated land at Burra Assunee village)	11 Depth to water not stated.	41	42	43	44
Assun Kullan—					
Pit No. 1, near canal (*reh* soil)	12 ...	45	46	47	48
Pit No. 2, about 1 mile from canal (*reh* soil) ...	.....	49	50	51	52
Pit No. 3, about 2 miles from canal (*reh* soil.)					
Well, near Pit No. 3 ...	13 ...	53	54	55	56
Pit No. 4, about 3 miles from canal (cultivated land in Assum Khoord)..	14 ...	57	58	59	60
Tahera Kullan—					
Canal water	15 ...	61	62	63	64
Pit No. 2 (*reh* soil)... ...	16 ...	65	66	67	68
,, ,, 2 do.	.....				
Jheel, near Pit No. 2 ..	17 ...	69	...	.	...
Soil used as manure ...	.....	70	71	...	...
Cultivated land	.....				
Kum Khera—					
Canal water...	18 ...	72	73	74	75
Pit No. 1 (*reh* soil)... ...	19 ...	76	77	78	79
,, ,, 2 do.	.....				
Jheel, near Pit No. 2 ...	20 ...				
Well water	21 ...				
Sunnauth—					
Canal water	22 ...	80			
Pit No. 1 (*reh* soil)	23 ...	84	81	82	83
,, ,, 2 do.	24 ...	88	85	86	87
Cultivated land	.....		89	...	..

The bags of soil are numbered in black, on parchment slips from 1 to 89, the bottles of water in blue chalk, in labels from 1 to 24.

From the Government of India to the Secretary of State for India,—No. 4, dated 10th January, 1865.

We lately transmitted to you copies of papers recently printed as selections from the records of the Government of India in this Department, on the subject of the deterioration of lands from the presence in the soil of the salt termed *reh*.

We now have the honour to advise the despatch to your address, by the screw-steamer *Lady Jocelyn*, of three boxes containing specimens of soil from *reh* land on the Western Jumna Canal, and samples of canal and spring-water, as detailed in the list herewith forwarded; and request that measures may be taken for their careful analysis by an agricultural chemist, whose attention should be directed to the discussions that have taken place on the subject.

The object in view is to determine, as far as may be practicable, in this manner, whether the opinion which has been generally adopted in this country as to the origin of the salt in question seems to be borne out by the facts, as ascertained from an analysis of the constituent elements of the soil.

If the efflorescence of the salt and its general determination to the surface of the soil are due to continued surface evaporation, and if the salts are supplied from the sub-soil itself, and are not introduced from the canal water, it may be anticipated that the analysis will show that the sub-soil contains the salts in a sensible proportion—a result which could not be attributed to the action of the canal.

We regret that specimens have not been sent to you in a more complete way, and with more full details as to the conditions of the soil in each place; but it would now be impossible to make good the defects satisfactorily, and the facts may probably be sufficiently ascertained from the data now supplied.

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From Colonel A. Taylor, R. E., *Officiating Secretary to the Government of the Punjab in the Public Works Department, to the Secretary to the Government of India, Public Works Department.—No. 7444, dated 30th March 1865.*

With reference to your letter No. 14-79 C., dated 6th January, I am desired to forward, for the information of the Government of India, copies of the papers marginally noted, containing reports by Captain Fulton and Mr. Garbett on the *reh* lands along the Western Jumna Canals, together with a sketch map showing the affected districts.

* * * * * * *

Report by Captain J. Fulton, R.A., *Officiating Superintending Engineer, Irrigation, Punjab, on Reh Lands.*

The lands affected by *reh* are generally reported to have in a measure recovered themselves, and to be in a better condition than formerly represented.

The amount of damage done by *reh* has probably been a good deal exaggerated; and although the evil is, no doubt, on the increase, it has not advanced with the rapidity ascribed to it.

As it was perfectly impossible for the European District Officer to visit every village, tehseeldars and other native subordinates were deputed to report on the subject: these latter appear to have made a greater outcry than was necessary.

I am informed that last year one of the Canal Officers visited localities described as destroyed by *reh*; and that he found wherever a small patch of *reh* had appeared in a field, the whole field was put down as *reh* land.

The fact of it having been proposed by District Officers to reassess land on which the Government revenue had been remitted, on the representation of its being unfit for cultivation, I think proves either that land can very quickly recover from *reh*, or that a mistake was made in remitting the revenue; in either case, my opinion is confirmed that the evil was not so bad as at first supposed.

There can, however, be no doubt that *reh* is a great and increasing evil, which should, if possible, be cured, and at any rate its further spread prevented.

I trust, that as the subject is one of such great importance, it may not be deemed out of place or uncalled for, if, after all that has been written and published on the subject, I enter pretty fully into it, commencing at the root of the evil—"the cause of *reh* in such quantities on the surface of the soil as to be injurious to crops."

1*st*.—Canal water cannot be the cause, as it has invariably been found purer than the generality of well water.

2*nd*.—Because *reh* is found quite as bad, if not worse, in places not in any way influenced by a canal.

3*rd*.—Because it is found to exist in fields irrigated by well water, as well as in land irrigated from the canal.

As therefore, the *reh* is not brought with the water, we must conclude that it exists in the soil, and try to discover the cause of its development.

It appears to me that the development of *reh* in sufficient quantities to be destructive to crops is caused in two ways:—

1st.—By certain substances being brought in excessive quantities to the surface of the soil.

2nd.—By withdrawal from that soil of certain other substances which would, to a certain extent, neutralise the bad quantities of the *reh*.

Sometimes only one of these actions takes place, but generally both work at one and the same time; or, to be more explicit, that which brings the one to the surface withdraws the other from the soil.

In the first case, I believe the *reh*,—which from the reports of Mr. Medlicott and Dr. Brown, appears to consist principally of sulphates,—is brought to the surface by capillary attraction when the soil is saturated with water,—it matters not whether the water comes from rain, wells, or canals; as the water dries up the *reh* is left on the surface of the soil. This can, of course, only take place where water lodges; if the water can run freely off, the salt is washed away with it; otherwise it accumulates on the surface, as in a large evaporating salt-pan. To prove that this is the case, I will mention a circumstance lately related to me by a native gentleman. Some years ago, there was a great deal of swamp land in the villages of Didlana, Begumpore, Baoli, Bal Jatan, &c.; the *reh* in these villages was also excessive. The Baoli drainage cut was made to carry off the water lying in the swamps; and it was found that not only were the swamps relieved, but land which was covered a foot deep with *reh*, and on which not a blade of grass would grow, became freed from the *reh* by the rain washing it away, and produced sugar-cane and other crops.

Whilst the first action of the *reh* being drawn to the surface is going on, the second is generally working in concert with it; for as the water percolates the soil, it carries the insoluble salt of lime existing in the soil with it, and deposits them in the shape of a *kunkur* bed below. The same lodgment of water that brings the *reh* to the surface deposits the lime below.

A certain proportion of lime is necessary in all soils to fit them for culture, for most grasses and plants largely absorb certain compounds of lime; if therefore, the lime be precipitated or absorbed to a large extent, the soil is rendered unfit for cultivation. According to Professor Fownes, "lime is of great importance in agriculture; it is found more or less in every fertile soil, and is often very advantageously added by the cultivator. The decay of vegetable fibre in the soil is promoted; and other important objects, as the destruction of certain compounds in marsh and peat land, is often obtained."

By Dr. Brown's account, the nitrate of lime is useful in decomposing the sulphate of soda, &c.

The carbonate of lime does no harm, as it is not soluble in pure water; moreover, we know that carbonate of lime, on coming in contact with any alkaline carbonate, is immediately precipitated, so that plants cannot absorb it. Sulphate of lime is beneficial in absorbing ammonia from the atmosphere; phosphate and super-phosphate of lime are also advantageous: if, therefore, lime in these different forms be useful, the absence of it must be injurious to the soil.

I observe it stated in the *reh* Report published by the Secretary to Government, Punjab Public Works Department, that, in some localities, *reh* is found without the underlying stratum of *kunkur*. I must confess that I myself have never met *reh* without *kunkur*, and seldom met *kunkur* without *reh*; this however, does not overthrow the fact that a certain quantity of lime is required in the soil to counteract the effect of *reh*.

Another fruitful cause of the development of *reh* seems to be the incessant cropping of the land, which never gets sufficient time between the crops to recover itself. In England, it is found necessary to allow land occasionally to lie fallow. The native cultivator, however, never gives his land a fair chance; he does not half plough it; he gives it very little manure; he swamps it with too much water; he knows nothing, and cares less for the rotation of crops; and he never gives it any rest. The idea that land requires rest is proved by the fact that many lands which have been given up as unfit for culture, have, after lying fallow for two or three years, been again brought under cultivation and yielded average crops.

There is, however, one extraordinary feature in some of these cases; and that is, the land does not recover itself until the land revenue has been remitted, after which the recovery is very rapid.

Though, however, canal water may not in itself be disadvantageous to the country, there are many ways in which it proves hurtful; and which as they to a certain extent are controllable, should especially engage our attention. The facility of pouring a large quantity of water over their fields, which the farmers have when they get it from the canal, instead of having the labour of drawing it from a well, is a fruitful cause of the development of *reh*; for the greater the supply of water, the greater the saturation of the ground, and the quicker development.

As the villages have such a command of water, they do not take the trouble to divide up their fields into small beds, but pour sufficient water into the field to cover the whole surface at once; if, therefore, there are any inequalities in a field, or if it is off the horizontal, it is necessary to give one portion of the field a great deal too much water to enable the higher portions to get enough.

The faulty construction of a canal is also highly injurious in some cases; for if the line of the canal, instead of being on the ridge of the country, from whence its waters can have a free flow over the ground, is carried along the drainage line, to be of any use, it is necessary, to a certain extent to embank the sides, which of course, prevents the drainage of the country from running off; it therefore collects and forms swamps on each side of the canal; and not only does the canal do this, but every water-course taken out of the canal, wherever it is in embankment, must be in embankment also; consequently the neighbourhood of the canal is covered with a net-work of high banks, which are an effectual bar to the drainage of the country, and form large evaporating pans for the development and accumulation of *reh*.

Again, if the line of the canal, instead of being pretty straight is full of small twists and turns, the water, impinging with the whole force of the current against the alternate banks, cuts them away till leakage takes place. This is an evil which is daily increasing; for whilst erosion is taking place at the bends at some places, silt is being deposited in the slack water behind the promontories at others. Thus, turns which at first may have been but moderate, are now very sharp, and will become more so in time.

The remedies for the chemical action I must leave to the Government Professors of Chemistry, but those which I proposed are:—

1st.—Re-alignment of the canal along the ridges of the country, instead of, as at present, in the drainage line. This will enable the canal to be in digging, instead of in embankment, thus preventing the side swamps. It will also leave the drainage line free to carry off the rain-fall and the *reh*, and canal water may wash it off the surface of the soil.

2nd.—A system of rajbuhas. They will do away with an enormous number of village water-courses, which at present are such a bar to the drainage of the country. They will facilitate the distribution of the water, and enable the farmers to get a more constant supply of water, which will prevent their taking too much at a time.

3rd.—Refusing water to *do-fusloe* land, thus forcing them to give their lands rest.

4th.—Refusing to give water to a field that is not properly broken up into small beds.

5th.—Clearing out the several drainage cuts that have been made, and which, from want of funds to meet the expenditure, have been allowed to get choked up and useless; and, by working new cuts, to carry off water where it is found to accumulate.

To carry out these improvements, we require a large European establishment, and a larger supply of funds to meet the expenditure.

I believe many of the evils adverted to have arisen from the want of officers to devise and superintend, and the want of funds to carry out necessary repairs and improvements.

From H. GARRETT, *Esq., Executive Engineer, Delhi Division, Western Jumna Canal, to the Officiating Superintending Engineer, Punjab Irrigation Works.—No. 528, dated 1st February, 1865.*

In reply to your Memorandum No. 1260 of the 27th ultimo, forwarding correspondence from the Chief Engineer of Irrigation, regarding the collection of specimens of *reh* soil and waters, I have the honour to state, for your information, that the Superintendent's Memorandum No. 977 of 1863-64, directing the collection of these specimens, was received by me on the 2nd December, 1863; that the map on which the *reh* areas were to be plotted reached me at a subsequent date, and were returned, when filled in, with my No. 426 of the 26th January, 1864. Their submission was somewhat delayed by my having to meet Major Merrick in Delhi, and my being subsequently ordered to meet the Finance Commission in Karnaal, on the 28th December, 1863.

The specimens from Balgong and Asun Kullan had been taken previously to my joining this Division, in the middle of November, 1863. These, and the specimens taken by myself, were forwarded to the superintendent, Western Jumna Canal, with simple registers of the various specimens. With the plans I submitted returns shewing the cultivated, culturable, unculturable, and *reh* areas of affected villages; but I did not consider that my short acquaintance with the district warranted my

offering crude opinions on a subject which had been so repeatedly discussed; and even now, with the advantage of having read the published correspondence and opinions on the subject, I am diffident in doing so.

There can, I think, be little doubt of the following conclusions:—

I.—The soil of the whole of the country in the Punjab lying west of the Jumna is impregnated with the elements of *reh*. That they exist in the soil and in the water, in proportions varying from the slightest trace to an extent which is absolutely injurious to all vegetable life. That these elements, where circumstances have favoured them, have developed into larger or smaller patches of *reh* efflorescence, which increase in size as one travels westward through the Barh, either from Lahore to Mooltan, or from Lahore to Shahpore, and on from either of these places to the Derajat and foot of the Soolimanee Mountain.

II.—That though it may be found in places so well drained as the perpendicular banks of a river valley—as that of the Ravee near Lahore—continual damp aids its promotion. The very worst place in which I have seen it is, I think, the Ghoreewall swamps, near Bunnoo, where the salty crystals run up the blades of grass with which the place is covered in branches similar to hoar frost, and it crushes under foot with a similar sound. The whole place seemed to me to have an acrid salty smell. This swamp is formed by percolation from the adjoining high lands, which are continually irrigated with the Kooram water; and yet these high lands show few traces of *reh*, and have crop after crop of the richest cultivation. Perhaps they owe their immunity to the fact of their being generally dug up by the Bunnoochees with spades, instead of being merely scratched by a passing plough. I would also cite, as an instance of the favouring influence of constant damp, the almost invariable presence of *reh* on the sides of the little water-courses from the wells of the Manjah.

III.—That the extent of *reh* depends on the average rain-fall of the district. Whether the rain dissolves, and so carries it away, or constantly denudes the soil of its upper layer on which the *reh* tends to form, is, I think, an open point. But the fact remains that there is but little in the north-west, where the rain-fall is great; and that in Mooltan and the Derajat, where the fall is trifling, the *reh* is excessive.

IV.—That pure sand seems inimical to *reh*, as it is alike absent in the productive plains of Murwat and the sandy wastes of the barren Thah.

I doubt whether it can be removed by mere washing or excessive flooding, as I have seen it in lands recently formed by the Indus, in similar situations in the valley of the Chenab, the Ravee, the Sutlej, and the Guggur at Moobarickpoor, on the road from Umballa to Kalka. But to return to the particular district which is now under consideration, the vicinity of the Delhi Branch of the Western Jumna Canal. The largest area of *reh* soil is that near its head, where the surface of the canal water is below soil, and the extent of irrigation is but small; thus showing that the canal has had but little influence on its formation. This patch extends on either side of the new left rajbuha for its first six miles; and on the right bank of the canal it runs through the lands of Ball Tuttan, the two Assuns, Khoord, and Kullan, down to Kokranah.

It is more or less covered with grass and jungle, interspersed with big open patches, and these are here and there broken in upon by cultivation.

The *reh* decreases onwards past Nowltah to Sitowlee; but thence, for some distance, it seems to increase in intensity, though diminishing in extent through Sitowlee, Jajee, Butgong, Kanah Kheree, and Teldrah Kullan. The canal line there, however, is tortuous; its banks are high and interrupt the drainage; and the country suffers much from swamps. The Butgong lands are fit for little else than rice cultivation; but this single crop is valued from a lakh to a lakh and a half of rupees a year.

Reh appears again in the large village of Bowanah, on land covered with a patchy growth of jungly shrub, and, finally, in the low marshy tract between Alimpore and Budhe Serai.

Seeing, then, that *reh* naturally exists to an extent probably exceeding human control, and that it will show and develope itself to an injurious extent under the influence of continued damp, it seems to me that the natural remedy—the first step even, before applying any other remedy—is to replace the country as far as possible, in the state it was in prior to the opening of the canal in respect to its drainage, and to free it from its present water-logged state. The remedies, therefore, that I would beg to urge, are those which have been laid before Government from time to time during the past 15 years, *viz.*, the construction of a new line of canal for the Delhi Branch; 2nd, a system of rajbuhas which will admit of some control over the water-supply; and 3rdly, thorough drainage.

Knowing that many lands have recovered themselves from being simply thrown out of cultivation for a few years, and thus for a while deprived of constant irrigation, and that similar evils have not attended the irrigation in other districts with better drainage and a lower spring line, I feel confident in the conclusion that the true remedy lies in drainage.

Even if chemists can supply an antidote, as is seemingly sought from them, it will probably be partial; it must be expensive, as it must be continually applied to counteract the evil forces which are continually acting; and further, I would submit, that instead of seeking the aid of chemistry to destroy and get rid of a natural product of such extent as *reh*, its aid should be sought to transmute it into some article of use and value, for surely those chlorides or carbonates of soda which appear in the analysis must be of commercial value.

If the problem is simply to get rid of it, it might be done in many places by simply setting up the lands; and thus getting rid of two enemies at once and making the one counteract the other, without the chemist's aid.

I forward copies of rough notes made in my pocket-book when collecting the specimens, and I trust they will suffice to describe the sites, and enable you to lay them down on the sketch map.

OOSUR LANDS.

Remarks on Saline Efflorescences on certain lands in Upper India
By LIEUT. J. F. POGSON.

It is strange that the *Oosur*, or naturally barren soil, which seldom contains saline substances, should have been confounded with the *kullur*, or sterilized soil, artificially produced by the over-irrigation of previously fertile land, and incorrectly called *Reh*, which is quite another thing.

As the subject is one of interest, I will with your permission, supply some information which may perhaps be useful to the persons concerned, and be instructive to others who cannot at present tell the difference between a saline efflorescence which is productive of fertility, and another which produces sterility.

The Hindee and Sanscrit word *oosur* simply means naturally barren land, and is quite distinct from lands which are unfit for the production of ordinary grain and root crops, in consequence of being overcharged either with common salt, or other saline matters in which it is present. The sterilizing powers of salt will be better understood when it is known that two per cent. of salt in the soil, will prevent its growing wheat crops, &c. &c., An inspection of the subjoined table will show the difference between a naturally fertile and naturally barren soil:—

Components.	Fertile.	Barren.
Organic matter	97·00	46·00
Silica (in sand and clay)	648·00	778·00
Alumina (in the clay)	57·00	91·00
Lime	52·00	4·00
Magnesia	5·00	1·00
Oxides of Iron	61·00	81·00
Ditto of Manganese	1·00	0·50
Potash	2·00	Trace.
Soda } as common salt	4·00	"
Chlorine } as common salt	2·00	"
Sulphuric acid	2·00	"
Phosphoric acid	4·50	"
Carbonic acid in Lime and Magnesia	40·00	"
Loss	14·00	4·50
	1000·00	1000·00

The true *oosur* land will in composition very much resemble the *barren soil*, and the more clay (alumina) it contains the worse the soil. To improve such land is out of the question. The Hindee word *reh*, means soil impregnated with fossil carbonate of soda; such earth is used for washing garments. The salt appears as an efflorescence, which when collected and operated upon yields soda, which the natives use in the manufacture of soap and inferior glass. This salt is a fertilizer, and may with great advantage be used as a mineral manure. The soil charged with it may be similarly used, being applied as a top-dressing to grain crops.

This explanation will show that there is no connection whatever between *oosur* and *reh* lands. The true *reh* soil is very fertile, the *oosur* hopelessly barren.

The Hindee word *kullur* means land which is barren and sterile from the presence of salt or saline matters containing common

salt. The table given beneath shows the composition of *kullar* and *natron* or *sujjee*:—

Components.	Natron.	Kullar.
Carbonate of soda ...	22·44	28·674
Sulphate of soda ...	18·85	34·642
Muriate of soda ...	38·64	36·228
Iron and Alumina...	0·00	0·092
Organic matter ...	0·00	0·364
Water ...	14·00	0·000
Insoluble ...	6·00	0·000
	100·00	100·000

The analysis shows that *natron* contains 38·64 per cent. of common salt, and the *kullar* 36·22 per cent. thereof. In their natural state of combination *natron* and *kullar* may be considered as sterilizers. But if they could be decomposed, and the different salts of soda separated from each other, we should obtain three valuable saline manures, to wit, carbonate of soda, its sulphate, and muriate of soda or common salt. But there is no hope of this taking place, as the Indian salt laws will not permit of common salt being separated from other saline matters, and as the consequence the land revenue has to be sacrificed to the salt revenue.

The Salt Department looks upon salt as a condiment to be taxed. Scientific agriculture however, proclaims it to be a most valuable manure. When used alone, it increases the production of wheat by 76 lbs. to the acre, and makes the grain fuller and heavier, thus increasing the weight per bushel.

The most valuable manure we possess out of India is a mixture of 1½ cwt. of nitrate of soda with 3 cwt. (4 maunds 2 seers) of common salt. This quantity applied to an acre of land increased the produce of wheat by 13½ bushels of 59 lbs. each, and the yield of straw by 12 cwt. 3 qrs. 4 lbs. The actual weight in pounds was 800, or in Indian weight, 9 maunds 24 seers extra of wheat, and 16 maunds additional of bhoosa.

The Salt Department will not let us have cheap salt for agricultural purposes, and the land revenue suffers in consequence.

The nitrate of soda is common in Upper India, *i. e.*, between the Sutledge and Jumna. I believe it is called *shorkhar* and *shor-sujjee* by the natives, who may not touch it. Thus two most valuable manures are kept out of use by departmental obstructions.

This salt also appears on the soil as an efflorescence. When thrown on the fire it deflagrates, which *kullar* does not. The nitrate of soda, used as manure, without any salt, gave an increase of 602 lbs. of wheat, and 10 cwts. 2 qrs. 21 lbs. of straw.

The Sanscrit word *sujjee** means *natron*, and the soil impregnated with it is called *sujjee-matee*, just as *reh* soil is named *reh-matee*. It is by no means uncommon to hear the words *sujjee-matee* applied to *reh* soil. The difference however is very great. The one will form a soap with olive oil, and the other will not, nor will *kullar*. This if thrown on the fire will *decrepitate*. *Natron* appears as an efflorescence, on the surface of the soil, but is not accompanied by vegetation which is always the case with *reh*.

The Hindee word *khara* means any solid or liquid substance which is saline or brackish to the taste. *Khar* by itself means potash, the word and preparation being peculiar to the saltpetre manufacturers. The sulphate of soda, when it appears on the soil as an efflorescence, will be called *khar* by any native who has tasted it, otherwise it will be denominated as *kullar*. The *khara-cessaud* of the bazar is made from the *khar* soil. The sulphate of soda in its manufactured state, is of decided value as a manure. But the Salt Department prohibits the manufacture, as common salt is generally associated with the sulphate of soda.

Of the efflorescences named the carbonate and nitrate of soda are fertilizers. But the others, known as *sujjee*, *kullar*, and *khar*, are sterilizers so long as they remain in the soil, though under proper manipulation, all can be turned to account as valuable saline manures.

The information I have supplied will I trust be useful to the European planter and settler, and enable him to distinguish and make use of saline efflorescences, but as far as the ryot and zemindar are concerned, agricultural prosperity cannot take place with money at 37½ per cent. compound interest, a salt duty of £8-15-6 per ton, and high prohibitive duties on all saline manures.

In conclusion, I would wish to observe that whilst the task of trying to reclaim lands sterilized by *kullar* by surface and subsoil drainage, is labour and money thrown away; there is nothing whatever to prevent these lands from yielding a high revenue, for years to come, (or until the *kullar* is exhausted,) if they were ploughed and sown with the seed of the *salsola soda* plant which when harvested, dried and burned, yields a saline ash, containing 20 per cent. of carbonate of soda, and constitutes the *barilla* of commerce, which is in great demand in England and America for the manufacture of superior soap.

The plant is called *lana* by the natives, and is indigenous to India, and grows in that part of the Delhi district where the Jumna canal discharges its waters, and runs to waste.

In my previous communication, on the subject of *reh* and *kullar*, I laid before your readers an analysis of *kullar* as compared with *sujjee* or natron.

I have recently been arranging my papers, and amongst those for 1865, I found a London analysis of *reh* which was copied from a printed official report on *reh* and *kullar* sent for my perusal by the Lieutenant-Governor of the Punjaub.

A consideration of the analysis given beneath will show how much *reh* differs from *kullar*, and will, I trust, convince the reader, that as stated by me, the former is a fertilizer, and the latter a sterilizer.

Analysis of Reh (soil) from the Western Jumna Canal.

	Reh.	Kullar.
Organic matter ...	6·61	0·364
Silica ...	54·46	.....
Alumina ...	4·47	.....
Lime ...	2·93	.....
Magnesia ...	1·49	.....
Oxide of iron ...	2·80	0.092
Potash ...	1·84	.....
Soda and common salt ...	11·85	64·902
Sulphate of soda ...	0·00	34·642
Sulphuric acid ...	6·08	.....
Phosphoric acid ...	Trace.	.....
Water or loss ...	7·40	.....
By Professor Anderson of London	100·41	100·000

The *kullar* contains 28·674 of carbonate of soda, and 36·228 of common salt. The sulphate of soda so largely present therein contains in every hundred parts 19·25 of soda, 24·75 sulphuric acid, and 56·00 of water. The common salt is a compound of 60 parts of chlorine and 40 of soda=100. The reader, if conversant with agricultural chemistry, will see that this *reh* soil only requires to be *limed*, to make it most productive. The common salt which is over-abundantly present requires to be decomposed by the action of lime, which would take up its acid, (chlorine) and set the soda free. The land would now produce heavy crops of turnips, potatoes, or rape, followed by maize or large millet, (*Jowar*), and when these were removed, barley would follow, with maize as a summer crop. The land after this was harvested would be sufficiently sweetened to grow wheat and all other winter crops. It would require four tons, or 108 maunds of slaked lime (*chunam*) to neutralize the injurious effects of the common salt. This at the very highest rate would cost Rs. 54, but the outlay would very speedily be repaid. The genuine *reh* soil requires no *liming*, though if manured with the *phosphate of lime*, the grain produced would be so superior, as to be fit for the London market. At present Bengal wheat is unsaleable in England, but by improving its quality, we might in a few years drive the *Odessa* wheat out of the market.

The following extract connected with *reh* soils still further illustrates their value, and shows how easily a revenue officer may be imposed upon if not conversant with the nature and composition of saline efflorescences.

"Such are some of the soils in India, which by washing yield from 1 to 7 per cent. of saline matter. Thus in several Indian soils examined by the late Mr. Fleming of Barochan, there were contained in 100 parts—

	1st	2nd	3rd	4th	5th
Carbonate of lime	7½	5½	4½	4	2
" of magnesia	3½	2	0½	1	...
Saline matter (chlorides, sulphates and nitrates).....	1	1½	3½	3	7

"No. 1. was near Gya in south Behar. Never lies fallow, is covered with water during part of the rainy season; produces from 30 to 50 bushles of wheat per acre.

"No. 2. same district. Not inundated by the rains; produces wheat, peas, cotton or poppy in the dry, and Indian corn and millet in the wet season. Sometimes manured with wood ashes and cow-dung.

"No. 3 from North Behar, Tirhoot. Deep loam, yielding two crops yearly. Not flooded, 25 to 30 bushels of wheat per acre.

"No. 4 Tirhoot. Light-coloured soil, and not so productive as No. 3. Saline efflorescence in patches.

"No. 5. Tirhoot. Still less productive; nearly sterile in places from saline efflorescence, except in the rainy season, when it produces good crops of Indian corn.

"From these examples we see that from 3 to 4 per cent. of saline matter may exist in a soil in certain circumstances, without rendering it unproductive. More than this, however, few soils can contain, and yet continue productive. Where such large quantities occur, the saline matter ought to be washed out

* *Sujjee*. The balls or lumps of manufactured impure soda sold in the bazaars, is also called *sujjee*, and this article, when purified, is the *lowna* or *goolunder sujjee* of the bazaar.

and carefully analysed. A large proportion where the soil continues fruitful, will usually prove to consist of the nitrates of potash, soda, or line. (*Vide Professor Johnston's Instructions for the Analysis of Soils, pages* 62, 63.)

"The soil No. 4, if treated with *kunkur* reduced to powder, would at once be restored to fertility, and if after this application, the efflorescence appeared, the patches should be treated with slaked lime, in the proportion of one seer to the square yard of saline patch.

"The soil No. 7 would require four tons of slaked lime to the acre, and the lime should be slaked with water holding saltpetre in solution. Three *maunds* of nitre would be required. It has been shown that *salt* and *nitrate of soda*, acting together, produce the best saline manure, and the heaviest wheat crops. The nitrate of potash or saltpetre will do the same. I trust this information will be of value to the Tirhoot European landed proprietors."

I have alluded to the phosphate of lime as being greatly needed for the improvement of all our grain crops, and especially so for wheat.

The wheat of Central Spain is best suited to our climate, and if once introduced would speedily displace the inferior wheat at present cultivated. The problem before the European planter is this. Is it worth while producing from 30 to 50 bushels of first-class wheat per acre, for sale in the London market, or is it not?

The bushel of wheat weighs on the average 60 lbs.: and the quarter 480 lbs., or *maunds* 5, seers 31½, and 800 grains. The average price of wheat was in 1869, 40*s.* 2*d.* per quarter, and the average for 1868 was 63*s.* 4*d.* per quarter. In 1869, Russia supplied England with 7,761,915 cwt. of wheat and in the previous year, our next door neighbours of Egypt, sent over 3,178,675 cwts. of wheat to London. During the year 1869 England purchased 32,648,951 cwts. of wheat towards which enormous quantity India did not contribute a single ton, and yet with proper management we should be able to cut out Russia and America, who between them supply us with 18¾ million cwts. of wheat. The information supplied will enable the European landed proprietor and planter to decide whether wheat farming will suit his books or not. My own opinion is that it will, provided he can be supplied with the phosphate needed at a cheap rate.

The fossil phosphate of lime exists in the *Sewalicks* in the greatest abundance. The supply may be said to be almost incalculable, but *unless private enterprise* enters the field, and subscribes capital for quarrying and utilizing this most valuable *fertilizer*, the mineral wealth brought to notice must and will continue to be neglected. To show how much this phosphate is valued by the British farmer, I have only to refer the reader to the London *Spectator* of the 30th September last, in page 1186 of which he will find the Prospectus of the new Sombrero Phosphate Company, capital £130,000, with power to increase. The island of Sombrero in the West Indies has been leased to this Company by the Crown at a rental of £1,000 per annum.

"The phosphate of this island is of the highest quality, and commands a ready and preferential sale at £5 per ton, at which price the present proprietors are refusing contracts, on account of the upward tendency of the markets."

The fossil phosphate of lime of the *Sewalicks* is superior to the above, the bones of antediluvian and existing animals being found imbedded in the matrix, which in consequence must also be rich in phosphates. This mineral contains in 100 parts 45·05 per cent. of lime, and 45·95 of phosphoric acid

The phosphate of Spain, according to Doctor Wallaston, contains 48·5 of lime and 51·5 per cent. of phosphoric acid, and, as in the *Sewalicks*, entire hills are formed of it.

One hundred pounds of the ash of the grains of wheat contain 46lbs. of phosphoric acid united with 31lbs. of lime, 12lbs. of magnesia, 1lb. of oxide of iron, and 31lbs. of potash and soda. sand or silica there is but 1lb. and of chlorine 6. Total 100

The soils of Tirhoot and other productive *rich* soils are rich in everything but the *phosphate of lime*, and as the natural consequence, the grain produced (wheat) is of inferior quality. Let the best Indian wheat be analysed, and it will be found that silicia or flint is the principal mineral matter present therein. It was but the other day that the European miller in charge of the Cawnpore steam flour mills, positively refused to grind a sample of wheat for fear of injuring the mill stone. This *flinty wheat* if sown on land suitably manured with phosphate of lime would cease to be flinty, for wheat only assimilates or *takes up silica*, when the proper substances are wanting. One hundred pounds of wheat straw ash contains 66lbs. of *silica*, and only 5lbs. of phosphoric acid. The grain is fed by the stalk, the stalk by the roots, and the roots by the soil. Hence it follows that if the soil is deficient in phosphates, soluble *silica* will as far as possible take their place, and produce flinty wheat, Indian corn, &c., &c. The Indian agriculturist (ryot and zemindar) may thank his stars that for eight months out of the twelve, the country teems with creeping things and insect life, whose birth, life, and death, keeps up a small annual supply of phosphates in his fields, but for which, a general failure of crops would be the order of the day. The discovery of the great ossiferous deposits of the *Sewalicks*, is due to Baker, Durand, Cautley, and Falconer. They are distant, some 25 miles from Saharanpore westward of the Jumna river, and when worked the fossil could be brought by boats, *viâ* the Western Jumna Canal, to the railway which crosses it. From this point it would be carried by rail to the Ganges Canal, and thence by boat to the Jumna termination of that Canal, where a depôt would be formed. The fleet of boats belonging to the company would take in cargo at this depôt, and after passing Allahabad, would supply the demands of the planters of Mirzapore, Benares, Ghazeepore, and all other river stations between it and the *Soonderbunds*. If the question is taken up, and a company formed, I shall on some future occasion show how the mineral may be used without dissolving it in the sulphuric acid.—*Journal of the Agricultural and Horticultural Society of India.*

The Planters' Gazette.

BOMBAY, 22ND JULY 1872.

TEA ESTATES.

THE tea market has opened at Canton, and several settlements have been made. Prices are reported much higher than last year. The opening thus early—earlier than has ever been the case before in Canton—may, according to a contemporary, possibly have a disastrous effect on trade. "Teamen and native hongs, seeing the eager haste with which tea tasters and buyers outbid each other, are too astute not to take advantage. Hence present high rates, and hence too, heavy losses as soon as the teas are placed on the London market."

THE *Darjeeling News* states that the Falbodhi Tea Estate in the Terai, has been purchased and made into a *limited* Company under the auspices of Messrs. Lloyd & Co. The capital about 2 lacs of of rupees was subscribed and the Company formed in 24 hours! "About 6,000 acres of land, 154 acres of tea and buildings and machinery complete for manufacturing and storing *secundum artem*, besides fine tracts of timber and valuable *Zemindari* rights was too tempting a bait to be resisted, now that tea has nearly recovered its good name as a tolerably safe investment."

WE have good news from Kangra also. A severe thunder storm, with heavy rain, has passed over the greater portion of the Kangra valley, and it is hoped the rain-fall will considerably augment the already favorable out-turn. Many of the plantations are said to have doubled their yield of former years, and it is anticipated that the Kangra Valley Tea Company and Holta Estates alone will produce upwards of 150,000 lbs. of tea this season.

TEA PLANTING, says the *Darjeeling News*, does not present the easy healthy life which so many are apt to reckon upon. The constant daily exposure in sunshine or rain at greatly varying elevations on the Darjeeling slopes, to say nothing of the trying nature of the work *inside* the factories, which are unavoidably kept at a high temperature while the process of tea-making is going on, tries the health of all but those blest with sturdy constitutions. Our contemporary counted the other day no less than eleven sick planters who had been obliged to come up to the station to recruit their health, from the vicinity of the Terai, where the heat of the season is described as unbearable. Of the eleven invalids two had to leave for England at once. Without any wish to discourage men from embarking in the business of tea-growing, our contemporary thinks it a duty to say that all should consider how far their health and constitutions qualify them for the arduous life and the exposure to extremes of temperature encountered by every man who properly supervises his work.

COFFEE ESTATES.

THE prospects of the coffee crop in Coorg are not very promising, owing, it is said, to the berries not having properly formed on some of the estates.

A PLANTER is of opinion that the *Observer* is taking rather too sanguine a view of the coming crop in Ceylon. It will be good, he says, but not very good. "Some districts, because they are young and have increased so much, may be doing first-rate: individual estates here and there may be also up to the mark, and the total crop may perhaps exceed whatever has been before, but I fear that districts generally north of Kandy will only give fair average, and nothing like what was expected at one time. Leaf disease *has* made its mark more or less, and *still* exists."

TEA.

TEA-PLANTING ON THE NEILGHERRIES, PAST AND PRESENT.

WE have explained in a former portion of these papers, that there are two essentially distinct varieties of the tea-plant; the one, the indigenous plant of India, is a native of warm moist districts of Eastern Bengal and the Looshai Hills, extending also to the province of Munipoor; and the other, if not a native of, at all events, brought from the Hill districts of China.

All the varieties of hybrid that have been obtained by crossing between these two distinct varieties, differ considerably in their character, habit, and constitution; and although we know from experience that plants are capable, to a great extent, of acclimatization, this process is one which takes place very gradually. One must, at the outset, in forming a garden, obtain a class of plant which is likely to take kindly to the climate in which it is to be planted.

One thing is very certain, and has been proved beyond all possibility of doubt, and that is, that the pure China bush is the least profitable class of tea that can be cultivated in India. Its growth is slower than that of other kinds, and in temperate climates, like that of the Neilgherries, it has a propensity to ripen its wood too rapidly, and bear seed instead of leaf. The indigenous plant, when planted in unfavorable localities, shows signs of decline, and is therefore almost equally unfit for cultivation at high elevations. In open and exposed situations, it feels the effects of cold atmosphere and rough winds; but even under these circumstances it seldom bears much seed, unless specially trained and cultivated for that purpose. Good hybrids, on the other hand, while they possess in a great measure the leaf-producing power of the indigenous plant, and bear comparatively little seed, derive a considerable amount of hardiness from their relation to the China plant. They conform themselves more readily than the indigenous to differences of climate, elevation, and soil, and are, on the whole, the most profitable sort to grow in Hill districts. A good class of hybrid plant can easily be detected by any one who has had the least experience of tea-planting, both by the form and growth of the bush, and the shape, size, color, and texture of the leaves.

The indigenous plant always grow on a single stem, and shews greatest reluctance to forming a bush. The stem also grows stronger and smoother than that of the China variety, and the leaves which are of enormous size, are soft, silky and of a bright green color. A single flush picked from an indigenous bush will weigh as much or more as four or five flushes picked off a China plant, and despite their size, and unwieldy look, roll into a better tea than can be obtained from any other plant. Those leaves are of great length, and very broad in proportion; at the end for the last three-quarter-inch of the leaf, they are very acuminate and have the petioles longer than is the case in other varieties. Seed of this class is now very difficult to obtain, except in small quantities at very high rates, partly owing to the few gardens in Assam or Cachar, on which the pure indigenous plant alone is cultivated, and partly owing to the demand there is for it, in consequence of the large extensions which are taking place now in those districts. The few gardens which possess it, require all their out-turn for the purpose of extending their gardens, and outsiders stand a poor chance of getting any. The best elevation at which to grow this plant would be between 3,500 and 5,000 feet. It will bear leaf well at even higher elevations than this, but is less likely to mature its seed. Being so shy a seed-bearer, the out-turn of leaf is not thereby affected, and the seed is too valuable an article to be esteemed lightly.

With regard to hybrids, those are the best which bear the greatest resemblance to the indigenous plant. They all possess much greater hardiness than the last named, and yield nearly, if not quite, as much leaf. They may safely be grown up to an elevation of 6,000 feet, beyond which we should not advise any one to plant tea. In imported seed there is always a considerable difference noticeable between individual plants, and if any particular plant appears to be so good in quality as to deserve propagation, the best course will be to cover the plant at the time of the bursting of the blossom, with tiffany or some such other light material, removing the covering when the seed has well set.

In Bengal seed usually ripens about October, or the beginning of November, but here on the Neilgherries, the process of ripening takes place more or less the whole year round. The planter can tell when the seed is nearly ripe, by the capsule presenting a dry and brown appearance.

The seed obained from plants treated in this manner should be exposed to the sun for a few days, and then carefully planted in a well-dug nursery of good soil. When fit to transplant, the seedings should be planted out far apart, on good land, at a moderately low elevation, and care should be taken that there are no other tea trees in the immediate neighbourhood. Trees that are intended to bear seed should be left unpruned for the first four or five years; the only case in which the knife should be used would be when the bushes were growing too thick internally, and light and air shut out from the ripening seed.

A few acres of land treated in this way would form a very profitable investment for a small amount of capital, as good seed is, and always will be, in great demand on these Hills.

There is another point worthy of notice before we leave this subject. Tea manufactured from China bushes is always weaker and more insipid, than that manufactured from indigenous or hybrid bushes, and as the great desideratum in the home market is the strength of the tea, attention should be paid to this matter. The former tea also gives larger and better colored pekoe tips, which latter enhance, in so small degree, the value of the article.

Up to the present time, though only small packages have reached the London market, Neilgherry teas have, when properly manufactured (and not sour—a very frequent failing up here) commanded very satisfactory prices, and there seems to be no reason why, when the best processes of manufacture are more generally known and appreciated, they should not always fetch at least 2s. per lb. With a well-trained staff it is by no means a difficult matter invariably to turn out good tea, ordinary care being all that is required.

On the whole, our advice on the present subject is, spare no pains to get the best class of seed suitable to your soil and elevation that you can procure; the trouble taken at the outset will amply repay you in after years, and if the garden is cultivated gradually, you may have, in three or four years, sufficient seed of good quality for all your own requirements, and a little over with which to supply your neighbours. Tea seed of a bad class is practically useless for all purposes, while good seed will always command a high price. —*South of India Observer.*

PRIZE ESSAY ON THE CULTIVATION AND MANUFACTURE OF TEA IN INDIA.

(By Lieut.-Colonel Edward Money.)

TEA DISTRICTS AND THEIR COMPARATIVE ADVANTAGES.

CLIMATE, SOIL, &c., IN EACH

THE Tea districts in India, that is where tea is grown in India to-day are—

1. Assam.
2. Cachar and Sylhet.*
3. Chittagong.
4. Terai below Darjeeling.
5. The Dehra Dhoon.
6. Kangra (Himalayas.)
7. Darjeeling (Himalayas).
8. Kumaon, (Himalayas).
9. Hazaroobaugh.
10. Neilgherries, (Madras Hills).

In fixing on any district to plant tea in, four things have to be considered, *viz.*, soil, climate, labour, and means of transport, and when the district being selected, a site has to be chosen. All but the second of these has to be considered again, and further lay of land, nature of jungle, water, and sanitation.

I will first then discuss generally the tea districts given above, as regards the advantages of each for tea cultivation. As some of the remarks I shall make are hearsay, and some the results of personal experience, and it would not be convenient to state which they are each time, I may mention that I have seen, and studied tea gardens, in all the districts named, except Nos. 4, 5, 7, 9, 10. What I know of these last is from what I have read, what is generally known of their climates, and what planters from each have told me.

Before, however, comparing each district, we should know what are the necessities of the tea-plant, as regards climate and soil. Tea, especially the China variety, will grow in very vary-

* These are virtually one, and I shall allude to both as Cachar.

ing climates and soils, but it will not flourish in all of them, and if it does not flourish, and flourish well, it will certainly not pay.

The climate required for tea is a hot damp one. As a rule a good tea climate is not a healthy one. The rain-fall should not be less than 80 to 100 inches, per annum, and the more of this that falls in the early part of the year the better. Any climate which though possessing an abundant rain-fall suffers from drought in the early part of the year, is not *cetera paribus* so good, as one where the rain is more equally diffused. *All* the tea districts that would yield better, with more rain in February March, and April, and therefore some, where fogs prevail in the mornings at the early part of the year, are so far benefitted.

As any drought is prejudicial to tea, it stands to reason hot winds must be very bad. These winds argue great aridity and the tea plant luxuriates in continual moisture.

The less cold weather experienced, where tea is, the better for the plant. It can stand, and will grow, in great cold (freezing point, and lower in winter is found in some places where tea is), but I do not think it will ever be grown to a profit on such sites That tea requires a temperate climate was long believed, and acted upon, by many to their loss. The climate *cannot* be too hot for tea, if the heat is accompanied with moisture.

I have heard that tea will not flourish lower than about the 15th or 18th degree of latitude, even if all the other necessities of climate, heat, moisture, and the absence of a low degree of the temperature in the winter be there. Something in the climate near the equator is said to be hurtful. I have never seen tea lower than 22,° so do not speak from experience. Tea grown in temperate climes, such as moderate elevations in the Himalayas, is quite different to the tea of hot, moist climates such as Eastern Bengal Some people like it better, and I believe the flavour is more delicate; but it is very much weaker and the value of Indian tea (in the present state of the home market where it is principally used for giving "body" to the washy stuff from China) consists in its strength. Another all-important point, in fixing on a climate for tea is the fact, that apart from the strength, the yield is double in hot, moist climes, what it is in comparativgly dry and temperate ones. A really pleasant climate to live in cannot be a good one for tea. I may now discuss the comparative merits of the different tea districts.

Assam.

This is the principal home of the indigenous plant, and were it not for scarcity of labour, no other district could vie with it. The climate in the northern portions is perfect, superior to the southern, as more rain falls in the spring. The climate of the whole of Assam, however, is very good for tea, inasmuch as while there is plenty of moisture, the rain is comparatively light in the rainy season, and in this respect better than Cachar where, in the rainy months, too much rain falls. The tea plant yields most abundantly, when hot sunshine and showers intervene. For climate then I accord the first place to Northern Assam. Southern Assam is, as observed, a little inferior.

The soil of this province is decidedly rich. In many places there is a considerable coating of decayed vegetation on the surface, and inasmuch as all places where tea has been, or is likely to be planted, it is strictly virgin soil, considerable nourishment exists. The prevailing soil also is light and friable, and thus with the exception of the rich oak soil of the Himalayas, and perhaps, the soil in the Terai under Darjeeling, Assam in this respect, but with those two exceptions, is second to none.

As regards labour we must certainly put it the last on the list. The Assamese, and they are scanty, won't work, so the planters, with few exceptions, are dependent on imported coolies, and inasmuch as the distance to bring them is enormous, the outlay on this head is large, and a sad drawback to success in tea cultivation.

The Berhampootra, that vast river which runs from one end of Assam to the other, gives an easy mode of export for the tea, but still owing to the distance from the sea-board, it cannot rank in this respect as high as some others.

Cachar.

The indigenous tea is found in a part of this province. The climate is inferior to Assam, because the rains are too heavy, but I think it takes the second place. In one and an important respect, it is even better than Northern Assam, more rain falls in the spring.

The soil is not equal to Assamese soil, it is more sandy, and lacks the power. Again, there is much more flat land fit for tea cultivation in Assam, and there can be no doubt as to the advantage of level surfaces.

As regards transport, Cachar has the advantage, for it has equally a water-way, and is not so distant from Calcutta.

The labour aspect is much the same in the two provinces, both being almost entirely dependent on imported coolies; but Cachar is nearer the labour fields than Assam.

Chittagong.

This is a comparatively new locality for tea. The climate is better than Cachar in the one respect that the rains are somewhat lighter during the rainy months, but inferior in the more important fact that much less rain falls in the spring. In this latter respect it is also inferior to Assam, particularly to Northern Assam. I therefore as to climate give it the third place. There is one part of Chittagong, the Hill Tracts, (tea has scarcely been much tried there yet) which, in the fact of spring rains, is superior to other parts of the province, as also in soil, for it is much richer there. On the whole, however, Chittagong must yield the palm to both Assam and Cachar, on the score of climate, and also I think of soil. For though good rich tracts are occasionally met with, they are not so plentiful as in the two last-named districts. Always, however, excepting the Hill Tracts of Chittagong, there the soil is, I think, quite equal to either Assam or Cachar.

As regards labour (a very essential point to successful tea cultivation) Chittagong is most fortunate. With few exceptions (and those only partial) all the plantations are carried on with local labour, which excepting for about two months, the rice-time, is abundant.

For transport (being on the coast with a convenient harbour, a continually increasing trade, ships also running direct to and from England) it is by far the most advantageously situated of all tea localities.

Chittagong possesses another advantage over all other tea districts in its large supply of manure. The country is thickly populated, and necessarily large herds of cattle exist. The natives do not use manure for rice (almost the sole cultivation) and, consequently, planters can have it almost for the asking. The enormous advantages of manure in tea cultivation, are not yet generally appreciated. It will certainly double the ordinary yield of a tea garden.

Terai below Darjeeling.

I have not seen this but have heard it *very* favourably spoken of. The climate is probably nearly equal to Cachar and the soil better. In the latter respect it is probably also superior to Chittagong. Planters are better off there for labour, than in either Assam or Cachar, but not so well off in Chittagong.

As regards transport, it is of course very badly situated, though, if ever a railroad is made to the foot of the Darjeeling Hills, this difficulty will be got over. On the whole, I should think this district a *very* promising one for tea.

The Dehra Dhoon.

I have heard the first tea in India was planted here. The lucky men, two officers, who commenced the plantation, sold it, I believe in its infancy to a Company for 5 lakhs of rupees. What visions did tea hold forth in those days!

In climate, the Dehra Dhoon, is far, far from good. The hot dry weather of the North-West is not at all suited to the tea plant. Hot winds shrivel it up, and though it recovers when the rains come down, it cannot thrive in such a climate. One fact will, I think, prove this. In favourable climates, with good soil, and moderate cultivation, 18 flushes or crops may be taken from a plantation in a season. With like advantages, and *heavy* manuring, 22 or even more may be had.

Labour is plentiful and cheap. The great distance from the coast, makes transport very expensive.

Kangra.

This is a charming valley, with a charming climate, more favourable to tea than Dehra Dhoon, still it is far from a tea climate. It is too dry and too cold. The soil is good for tea, better than that of Dhoon, but inferior to some rich soils in the Himalayan oak forests Local labour is obtainable at cheap rates. Distance makes transport, for export, very difficult; but more or less of a local market exists in the Punjab, and a good deal of tea is bought at the fairs, and taken away by the wild tribes over the border. With the limited cultivation there, I should hope planters will find a market for all their produce. Manure must be obtainable (manure had not been thought of for tea when I visited Kangra) and if liberally applied, it will increase the yield greatly.

Kangra is strictly a Himalayan district, but the elevation is moderate, if I remember right, about 3,000 feet, and the land is so slightly sloping it may almost be called level. A great advantage this over the steep lands, on which most of the Himalayan gardens, many in Cachar, and some in Assam and Chittagong are planted.

Kangra is *not* the place for a man who wants to make money by tea; but for one who would be content to settle there, and content to make a livelihood by it, a more desirable spot with a more charming climate could not be found. Land, however, is not easily procured.

Darjeeling.

I have never been there. The elevation of the station, 6,900 feet is far too great, but plantations lower down are, I believe, doing well, (that is well for hill gardens). The climate, like all hill climates, is too cold, but there is rich soil, and cheap labour, to make up for this. As regards transport, the Darjeeling plantations have the same difficulties as were detailed for the Terai below Darjeeling, with the additional expense of sending the tea down the hill. Like elevations in Darjeeling and Kumaon are in favour of the former, *first*, because the latitude is less; *secondly*, because Darjeeling Gardens are mostly on or near the outer slopes, and these are not so cold, as slopes and valleys far in the hills, where many of the Kumaon Gardens are situated. I believe, therefore, that the hill plantations of Darjeeling have a better chance of paying than the gardens in Kumaon, but, as stated before, no elevated gardens, that is, none in the Himalayas, have any chance in the race against plantations in the plains, always providing the latter are in a good tea climate.

Gardens, barely removed above the Terai (and I hear there are such in Darjeeling) can scarcely be called "elevated," and for them the remarks applied to the Terai are more fitting. As a broad rule it should be recognized, that the lower tea is planted in the Himalayas, the better chance it has.

Kumaon.

It was in this district (a charming climate to live in, with magnificent scenery to gaze at) I first planted tea in India, and I much wish for my own sake and that of others, I had not done so. I knew nothing of tea at the time, and I thought a district, selected by Government, for inaugurating the cultivation, must necessarily be a good one. No hill climate can be a good one for tea; but the inner parts of Kumaon, very cold, owing to its elevation, high latitude and distance from the plains, is a peculiarly bad one. Yet there it was Government made nurseries, distributed seed gratis, recommended the site for tea and led many on to their ruin by doing so. The intention of the Government was good, but the officers in charge of the enterprize were much to blame, perhaps not for making the mistake at first (no one *at the first* knew what climate was suitable) but for perpetuating the mistake, when later, very little enquiry would have revealed the truth. I believe it was guessed at by Government officials long ago, but it was easier to sing the old tune, and a very expensive song it has proved to many.*

I need scarcely, after this, add I do not approve of Kumaon, for tea. An exhilarating and bracing climate for man is not suited to the tea plant. The district has one solitary advantage—rich soil. I have never seen richer, more productive land than exists in some of the Kumaon oak forests, but even this cannot, in the case of tea, counterbalance the climate. Any crop, which does not require much heat and moisture will grow to perfection in that soil. Such potatoes as it produces! Were the difficulties of transport not so great, a small fortune might be made by growing them.

Could any part of Kumaon answer for tea it would be the lower elevations, in the outer ranges of the hills, but these are precisely the sites that have *not* been chosen. Led, as in my own case, partly by the Government example, partly by the wish to be *out* of sight of the "horrid plains," and in sight of that glorious panorama the snowy range, planters have chosen the interior of Kumaon. Some wisely (I was not one of them) selected low sites, valleys, sheltered from the cold winds, but even their choice has not availed much. The frost in winter lingers longest in the valleys, and though doubtless the yield there is larger, owing to the increased heat in summer, the young plants suffer much in the winter. The outer ranges, owing to the heat radiating from the plains, are comparatively free from frost, but there again the soil is not so rich. Still they would unquestionably be preferable to the interior.

Labour is plentiful in Kumaon, and very cheap, Rs. 4 per mensem. Transport is very expensive. It costs, not a little to send tea from the interior over divers ranges of hills, to the plains. It has then some days journey by cart ere it meets the rail, to which 1,000 miles of carriage, on the railroad, has to be added.

The long and short of the matter is, Kumaon *is not* a district in which tea can ever be grown to a profit. Some plantations, there are, which will I hope and believe pay their way, but they are quite the exceptions, and *they* cannot, I believe, ever pay a fair interest on the money laid out in making them. Now that these, (the exceptional ones) are made, it may be cheaper to keep them up than to abandon them, but as for the others (the Government plantations included) the *sooner* they are resigned the better. They can only be carried on at a loss.

Garhwall is next to Kumaon, and so similar, I have not thought to discuss it separately. The climate is the same, the soil as a rule not so good. There is one exception though, a plantation near "Lohla," the teas of which owing I conceive to its peculiar soil) command high prices in the London market. The gardens, both in Kumaon and Garhwall, have been generally much better cared for than those in Eastern Bengal. As a rule they are private properties, managed by the owners. But no care or attention, (and the one or two companies that exist there have first rate men as managers) can counterbalance a prejudicial climate.

Hazareebagh.

The climate is too dry, and hot winds, though not for long, are felt there. A great compensation though is labour, it is more abundant, and cheaper in this district, than in any other. The carriage is all by land, and it is some distance to the rail; still as will be seen by the comparative table further on, it is better off in this respect than some others. I have not seen the tea gardens at Hazareebaugh, but I do not believe they can ever vie with those in Eastern Bengal, inasmuch as the climate is very inferior.

The soil is light and friable, but not equal to some other districts.

Neilgherries.

This is I have heard too near the equator for the tea plant. The climate, otherwise, is superior to the Himalayan, for the frost is very slight. Were there however more heat there in summer, it would be better. It is a delightful place to live in, but I much question the success of tea there. The equable and temperate climate seems all that is required for Cinchona, but an equable and temperate climate is not suited to tea.

I have heard the soil is good, but have no certain information on this head. Not much difficulty can exist in the way of transport. *To be continued.*

* Is it possible that the continued deficiency was nothing more, was owing to the fact Government had gardens so well there? They were advertised for sale at the time at absurd prices. Now, we see, the purchasers are to be paid (!) the choice thing for Government to do is to abandon the lot.

COFFEE.

COFFEE PRODUCTION IN BRAZIL.

This mail has brought us a large mass of very valuable information direct from Brazil, the main results of which we shall summarize in successive issues for the benefit of our readers interested in coffee. To day we may say that our latest information, to 7th March from Rio, indicates that shipments in the first two months of 1872 showed an enormous falling off as compared with the average of former years and with the results for 1871. The comparison of 1871 and 1872 is as follows:

		1871	1872
January	bags	[illegible]	199,118
February	"	[illegible]	74,[illegible]
		[illegible]	[illegible]
Del. of 1872		[illegible]	—
Deficiency		[illegible]	

In truth, it will be seen, the shipments from Rio in the first two months of 1872 were considerably short of those for one month in the preceding year. Nor is this all. Messrs. Kern Hayn and Co., late Hope and Co., state on 6th March that advices from all parts of the interior agree that but very little coffee is left,—that is coffee of the season which will only end on 30th June. In the three months December, 1871, to February, 1872, the total shipments from Rio had been only 297,859 bags against 786,997 in the corresponding three months of 1870-71, a deficiency of 189,138 bags, equal at 160 lbs to the bag to 698,768 cwts. If figures mean anything at all, these mean continued high prices for all the coffee Ceylon can produce. What Emigration and Companies for cultivating may [illegible] Brazil remains to be seen, but our incredulity is at once [illegible] to find the prospectus of the newly launched Company [illegible] purchasing the Angelica Estate of 20,000 acres, stating that their calculations are based on an *average* yield of coffee equal to 11 cwts per acre. The soil of Brazil may be richer than that of Ceylon, but we decline to believe that an *average* of 11 cwts. per acre can be secured. Yields of 11, 15, and even 20 cwts per acre have occurred in Ceylon, but our average is not quite 6 cwts an acre for plantations generally. We doubt if the finest and youngest districts in the Island, with results unaffected by aged properties, could show a higher *average* than 8 cwts. We shall watch with interest, but with a good deal of doubt the experiment of coffee cultivation by European labour. With us the best which [illegible] the cultivation possible, *forbids* continued personal toil on the part of Europeans.—*Ceylon Observer.*

COFFEE CULTURE BY EUROPEANS IN CANTA IN BRAZIL.

The experiment about to be tried in Brazil of growing coffee and other tropical produce by the labour of immigrants introduced from Europe is one of great interest, and the success of which

we only wish we could anticipate. Our local interests need not stand in the way of a cordial wish that Brazil should prosper as a free country. There is evidently room enough for all the coffee growers of the world to do their best. We give elsewhere, the prospectus of the Brazils Coffee Company *in extenso*, and a good deal of fresh light is thrown on the details and prospects of the scheme of combined immigration and cultivation in the following communication from a gentleman who knows what coffee planting is, from his experience in Ceylon. Mr. John Gordon writes to us from London as follows :—

"For the amusement of the Ceylon planters I have sent you to-day the prospectus of the "Brazilian Coffee Company, Limited" and the map. You will observe there is a plantation of 200,000 trees. In Ceylon they plant 1,000 to 1,100 trees per acre according to the rocks, &c., but in Brazil they only plant 256 trees to the acre. You will see a great many nurseries that they call *plants*, and very small nurseries too.

"I have inspected the papers and valuation at the solicitors, and Mr. Beaton's agreement with the Brazilian Government to send out 10,000 emigrants from Europe, depending upon '*Alsace and Lorraine*,' over 5 years, viz.

1872	1873	1874	1875	1876
750	1,250	2,000	3,000	3,000=10,000

They are bound to support these emigrants for four months after their arrival, and if Beaton fails to perform his contract by not sending out the *whole number*, the whole of the Government money is to be returned.

"These emigrants are to be located on the Company's land as follows :—500 families with 4 acres each, 100 artizans with 3 acres each, 700 Farms of 6 acres, 450 Farms of 18 acres, and 120 Farms of 120 acres, and to be cultivated by the emigrants as well as to support themselves, they are to buy from the emigrants the coffee at *Santos* at 30 per cwt. all ready for the market, and sell it to the shippers at 45/6. They calculate that a tree produces 3·2lbs. of clean coffee on 256 trees, and the Company is to give a loan to each family of £40 for expences, and to enable them to bring the coffee into full bearing and the family is also to plant on the 4 acres corn and beans for their own maintenance besides the coffee produce, and the Company expect to make a clear profit of 330/o.

	Milreis.
"Now for the value of the 200 000 trees	200,000
" 10,000 young trees	25,000
" A dam with tank	37,000
" 3 dams on coffee plantation	11,000
" 2 derivations of water	2,000
" A Store of stone and mortar	20,000
" Mill and machinery	90,000

The whole of the 200,000 trees and 100,000 of young trees they value at £44,318 ! ! ! a tidy sum ; the value of the *whole* property nearly £10 per acre, 26,000 acres. From these emigrants they expect to raise the large quantity of 94,000 cwts. by 1882. They must first catch their emigrants before they *cook them*. However, it is quite plain that Europeans could not work in the fields in such a climate, and they are 164 miles from the sea-port. I do not think that the Ceylon planters have any thing to fear from Brazil in five years time."

The map, we regret to say, has not reached us as yet, probably because it was posted *via* Southampton. Another correspondent writes :—

"According to the framer's own showing the average yield in the province of S. Paulo is 11 cwts. per acre, while the average yield of the estate called Angelica was something over 7 cwts, according to the same authority. If the profit on this latter yield should give 30 per cent. on a comparatively poor estate for *Brazil*, after all deduction for London Offices, &c., it seems absurd that the former proprietors should have parted with this property, unless tempted by an arrangement which does not appear in the prospectus."

Of course the subsidy from Government is [illegible] this depends on the willingness of the Alsatians and others in Europe to leave their homes for the prospects held out to them. The climate seems to us the great difficulty, although that of the special site of the experiment is said to be the finest in the world. So we may say of our own higher districts, Dimboola and Dickoya, but then we refer to Europeans as overseers of labourers born and inured to toil in the tropics. There is a good deal to be allowed for latitude in Brazil, and we suppose 2,500 feet above sea level would have a climate equivalent to 4,000 feet with us in Ceylon. But there is still the fact that coffee will not grow well where the heat is not tropical for a large proportion of the day hours, the hours of work. To labour hard in the heat which suits coffee would mean to a large proportion of Europeans exhaustion of physical energy, liability to "jungle" fever and dysentery and to that fearful scourge which even now is sweeping over parts of Brazil, the fatal "yellow fever." What Mr Gordon says of the number of trees to the acre shews on what a different system to that pursued in Ceylon, much of the coffee in South America is grown. From our pruned trees we do not look for an *average* yield of much more than ½ lb. of clean coffee per tree. To get trees to yield over 3 lb. of clean coffee they must be planted far apart and allowed to grow with the minimum of interference from the pruner and handler. We are aware that the soil in Brazil is fertile, but what about the wind ? And what about the loss of berries and the breaking of branches in picking ? We should like to have information on these and many other points before we advised friends to take shares in the Brazil venture, notwithstanding the high standing of many of the Directors, and notwithstanding the guarantee of 7 per cent. for the first three years. There is this difference between Ceylon and Brazil. There land is so plentiful that it is often a mere drug in the market and capitalists fight shy of estates as security. Here good coffee land is now so scarce that its value is well assured, and a planter with "a young estate," a large proportion of which is still forest will have no difficulty in obtaining advances of money on fair terms. But there is a greater difference still. With the exception of the far-off and widely-separated Ouvah Districts, coffee estates in Ceylon are near means of communication and near the port of shipment. In Brazil the distances are great even where roads and railways, to some extent, exist. Now, looking at the distance of Santos from the Angelica Estate, (164 miles by rail and road, mainly the latter,) can our planting readers imagine that 30s. per cwt. paid at Santos, would remunerate the growers of the coffee ? The system looks too much like that of forced labour which has broken down in Java. It becomes us to speak with modesty when dealing with questions affecting an empire of which one province only, that of San Paulo in which the experiment is to be tried, is equal to the united areas of four islands the size of Ceylon. Still we must speak according to our light, and say that we rather desire than believe in the success of the Angelica experiment. One element certainly in its favour is the period of five years accorded to Mr. Beaton for introducing his immigrants. The immigrants themselves, if of the right sort, ought to prosper somehow, even if that prosperity were not directly connected with the culture of coffee and cotton. The vast area of Brazil presents every variety of soil and climate, and mineral wealth is likely to prove as abundant as agricultural resources. Population is what is wanted, and the larger the number of free labourers introduced the more likely are the manumitted slaves to avoid a hostile and exacting attitude in agreements to labour. The example of our own West Indian Colonies is always quoted to shew that production in Brazil must be greatly checked by emancipation. But much depends on the spirit in which employers of labour accept the change. In the United States the planters, after a few years of disorganization, have "accepted the situation" and they and the former slaves, working with a will and on equitable conditions, are fast restoring the lands of the South to teeming production in cotton, rice and sugar culture. We wish we could believe that either amongst masters or slaves there could be found qualities similiar to those which have rendered the transition to free labour so unexpectedly successful in the United States. There are elements of danger and difficulty in Brazil which will prevent rapid progress. But what with all the railway designs afloat, and all the other improvements contemplated in the greatest coffee country of the world, it is clear that we cannot hold even the secondary position we occupy, if we rest on our oars.—*Id.*

COFFEE-PLANTING IN NATAL.

Some time has elapsed now since we received from the author, Mr. W. H. Middleton of Snaresbrook Estate, Natal, a copy of his "Manual of Coffee-planting" intended for the use of planters in that colony. It is a pamphlet made up in the form of letters on the cultivation of coffee, and as the author tells us "professes to be only a relation of the practical experience and observations" of himself and a few friends who had given him information. The author accompanied the brochure with a private letter in which he was good enough to ask our advice with reference to a second edition and especially on the value of a novel idea which had occurred to him as worthy of being recommended to Natal planters. The second edition has since been published and a copy of the book has reached us which we will notice hereafter. Meantime, this second Book having appeared and the letter before us being dated 1866, there can be no breach of confidence in laying Mr. Middleton's theory before our readers. It is as follows :—"In Natal I find that the coffee tree bears most *abundantly, and with certainty*, for the first three or four years ; but afterwards the crop is very uncertain both in quality (well-formed beans) and quantity, owing, I think, to a deficiency of good bearing wood. Perhaps this to certain extent, might be corrected by proper and careful pruning, but it is most difficult to obtain the skilled labour for this purpose either in number or efficiency. Now, would it not be better to carry out the following plan :—say, plant out the fields in rows 9 or 10 feet by 5 or 6 feet, and in four years,

plant again between these rows. At the end of the 7th year, cut down the first trees planted, the second planted will then be in bearing. After one year of fallow, replant in the rows where the first planted trees were placed. By this means there would always be a succession of vigorous young bearing trees, which would require less labour (especially skilled) and return a better and more certain crop than if depending upon the old stock." Coffee-planting in Natal must offer a great contrast to the same pursuit in Ceylon to permit of Mr. Middleton suggesting even a mode of cultivation so impracticable and expensive. It must indeed be a poor look-out where the coffee shrub begins to languish in its seventh year, an age when it is usually in its prime, and whatever may have been the cost and scarcity of skilled labour for pruning, the Natal planters cannot fail to find the process of replanting recommended by our author much more expensive and unsatisfactory. We handed the copy of the first edition of the Manual itself at the time of its receipt to a practical planter, who favored us with the following notice of its contents, which with the other papers referred to, has been overlooked too long. Since the review was penned the writer, has himself disinterred up at our request "a Manual for Coffee Planters" to the pages of which we may now refer our Natal friends for information respecting the *modus operandi* in Ceylon:—

A Manual of Coffee Planting, by W. H. Middleton, Sharesbrook, Natal; PUBLISHED BY ADAMS & Co., DURBAN, NATAL, 1866.

This little pamphlet contains in its fifty-two pages a good deal of information important to an incipient planter. In fact a little respecting almost every operation of the plantation. The felling of the forest it is true is not described, but perhaps they have no forest in Natal. The *land* should be of the kind says our author that will absorb and hold in suspension the most water. Some of the early settlers in our Umlegomoa district would take exception to this doctrine, for their lands held the water so long and so tenaciously that it washed away all their rupees. Very probably however the land of Natal is chiefly sandy and planters are glad when they hit on a piece that retains moisture, for we cannot suppose that they wish it to hold water in its liquidity.

An eastern aspect is also recommended. We would add that this is not always the most desirable in Ceylon, especially under 2,000 feet elevation, for when the soil is thin and porous, too strong a sun in the early morning is not desirable. At elevations of from 3,000 to 4000 feet, an eastern is generally a safe exposure.

The Java style of tree is described as from 5 to 6 feet high, which he thinks bears the greatest quantity. Our experience in Ceylon, both for bearing capability, facility of management and early return is in favor of a low tree, 3 to 4 feet, unless in very exposed places where they are sometimes cut down as low as 1½ foot.

The Borer is described as a beetle, which does very little damage. This cannot be the insect which has been committing such ravages in India, as it is described as more resembling a caterpillar with a very hard head. There are few insects destructive to the coffee plants in Natal, but our author instances one which he says leaves a brown shell on the leaf. This must surely be *the bug*.

Berries found perfect under the trees he thinks are the work of rats. If there are monkeys in Natal they are more probably the depredators. But several classes of animals pick the coffee so and leave the parchment in heaps in this country, and what is worst the rogues can never be apprehended.

Nursery plants cost £4 13 8 per 1,000; formerly, they cost £7 10.—This is a frightful price, and it is quite time each estate in Natal, had its own nursery, for at this rate an estate of 200 acres would cost about £1000 for plants!

Holing—40 to 60 per day of holes 3 feet in diameter by 18 inches deep, would gladden the heart of a Ceylon Planter. We are obliged to put up with much less; very probably the Natal soil is softer than ours.

Planting distance—7, 8, and 10 feet are all very wide. But they grow cotton between which must be a doubtful benefit.

Jamaica picking is instanced as costing on an average 1s per bushel. We consider 6d. high and certainly could not afford 1s. At *Rio* pickers have to go and bring in their day's work in a bag probably 1 to 2 bushels. *Natal picking* is cheap—chiefly done by women, girls, and boys at 6d. per day. But we cannot exactly reconcile this low rate of wages with the intimation that Kaffirs who are extolled as models of tractability, are so uncertain that the planters are obliged to import Indian labour which cost about 28s. per month. Perhaps this is a work, however, for which the Kaffir women and children have a predilection and therefore turn out to it—only if they do not and if the 28s. labour has to be had recourse to, the above figure will not answer.

Calculations of an estate coming into bearing with a maiden crop of 2 cwts. the third year and afterwards giving 7 cwts per acre annually, for a new and comparatively untried district like Natal, out of the tropics too, are evidently *speculative*, as the author no where says that such crops have been realised. But if he is sure that they can be borne out, it shows coffee planting in Natal to be a very paying investment. Strange however as it may seem, in the face of this statement, several Ceylon planters who have gone there to settle have not found their expectations realised. On the whole while the Pamphlet contains nothing that is new, it contains a good deal that is true and will prove a useful hand-book to a beginner.

We may add a few further notes on the prospects of Natal, as a coffee growing country, albeit these are not of a recent date either. Dr. Mann, Special Commissioner of Natal, made the following remarks at a meeting in England on the position and prospects of coffee in that colony:—"Coffee is perhaps now the favourite object of industry upon the coast. It was first planted experimentally near Durban, twelve years ago; young plantations are now to be encountered everywhere, and there are several fine plantations already in full yielding. The quality of the produce is very fine, and the average yield large. The Mocha variety thrives to perfection. The one thing which has militated more than anything else against the rapid extension of coffee plantations, is the unwelcome fact, that for four years the planter has to meet outlay without returns; in other words, that he must have considerable capital to invest in his work. Some men of small means are, however, now gradually making their way in coffee, by clearing and planting small plots only each year, and making a return at the same time from the cultivation of other common crops, such as Indian corn, tobacco, and out forage. The coffee is chiefly planted on the slopes of the sea-hills, where there is suitable soil and exposure; and where the primeval bush is cleared away to make room for the plantation, artificial shelter being provided for the young plants by establishing rows of orange trees at convenient distances. It is estimated by competent authorities that 500,000 acres of land in Natal, at least, are suited for the growth of coffee; but in all probability, it will yet be found that it is possible to extend the plantations much further inland than was at first supposed, and that in this way another 500,000 acres will become available. It is confidently anticipated that one day the entire so-called coast region of Natal will be one vast stretch of almost uninterrupted coffee plantations."

We remember seeing it mentioned that a Natal planter on visiting his brother's estate in Ceylon was quite astonished to find the trees so vigorous and bearing so well at 18 to 20 years of age, and that too, notwithstanding the poverty of soil. He found, however, that the abundance of rain and the forcing climate of our hill-country afforded full compensation for the better soil of the African colony, and the magnificent jungle cut down here in order to cultivate coffee presented a great contrast to the character of the land utilised on the estates he had left behind, for the same purpose.

We conclude with an extract from a letter sent to an Indian contemporary respecting Natal:—"Having lately returned from a second visit to Port Natal, I am in a position to recommend it to all who have a small capital at their disposal. The colony possesses peculiar advantages for the old Indian. First—Along the sea coast is a climate where sugar, cotton, tobacco, and every Indian product attains the fullest perfection. Second—A constant and direct communication with England and nearly every part of the world by steamers and fast sailing clippers. Third—Coolies are beginning to be numerous, they thrive and like the country, which resembles India in many respects. Fourth—There are plenty of schools in a hill climate, at Pieter Maritzburg, distant seventy or eighty miles from Port Natal, or D'Urban as the coast town is called. Fifth—European workmen and petty tradesmen are in excess of the demand, so that it is about the cheapest portion of South Africa. Sixth—A convenient geographical position not too far [illegible] where we have the new *El Dorado* or future Ca[illegible]. When I left, coals, diamonds and copper were exciting the public; now it is gold and "much gold," if the accounts given are correct; and the world will perhaps soon pour forth swarms of adventurers from all the countries under the sun to reap the rich harvest. The colonists will also make money, as the "diggers" will have eventually to fall back on the stores of the country, for which they will have to pay heavily."—*Id*

THE PREPARATION OF COFFEE.

By Baron Leibig

"The chief operation is the *roasting*. On this depends the good quality of the coffee. In reality the berries should only be roasted until they have lost their horny condition, so that they may be ground, or as is done in the East, pounded to a fine powder.

"Coffee contains a crystalline substance, named caffeine or theine, because it is also a component part of tea. This matter

is volatile, and every care must be taken to retain it in the coffee. For this purpose the berries should be roasted till they are of a pale brown colour; in those which are too dark, there is no caffeine: if they are black, the essential parts of the berries are entirely destroyed, and the beverage prepared from these does not deserve the name of coffee.

"The berries of coffee, once roasted, lose every hour somewhat of their aroma, in consequence of the influence of the oxygen of the air, which owing to the porosity of the roasted berries, can easily penetrate. This pernicious change may best be avoided by strewing over the berries, when the roasting is completed, and while the vessel in which it has been done is still hot, some powdered white or brown sugar (half an-ounce to one pound of coffee is sufficient). The sugar melts immediately, and by well shaking or turning the roaster quickly, it spreads over all the berries, and gives each one a fine glaze, impervious to the atmosphere. They have then a shining appearance, as though covered with a varnish, and they in consequence lose their smell entirely, which, however, returns in a high degree as soon as they are ground. After this operation, they are to be shaken out rapidly from the roaster and spread on a cold plate of iron, so that they may cool as soon as possible. If the hot berries are allowed to remain heaped together, they begin to sweat, and when the quantity is large the heating process by the influence of air, increases to such a degree that at last they take fire spontaneously. The roasted and glazed berries should be kept in a dry place, because the covering of sugar attracts moisture.

"If the raw berries are boiled in water, from 23 to 24 per cent. of soluble matter is extracted. On being roasted, till they assume a pale chestnut colour, they lose from 15 to 16 per cent., and the extract obtained from these by means of boiling water is 20 to 21 per cent. of the weight of the unroasted berries. The loss in weight of the extract is much larger when the roasting process is carried on till the colour of the berries is dark brown or black. At the same time that the berries lose in weight by roasting, they gain in volume by swelling; 100 volume of green berries give, after roasting, a volume of 150 to 160; or, two pint measures of unroasted berries give three-pints when roasted.

"The usual methods of preparing coffee are: 1st, by filtration; 2nd, by infusion; 3rd, by boiling.

"Filtration gives often, but not always, a cup of coffee. When the pouring the boiling water over the ground coffee is done slowly, the drops in passing come in contact with too much air, whose oxygen works a change in the aromatic particles, and often destroys them entirely. The extraction, moreover, is incomplete. Instead of 20 to 21 per cent, the water dissolves only 11 to 15 per cent., and 7 to 10 per cent. is lost.

"Infusion is accomplished by making the water boil, and then putting in the ground coffee, and vessel being immediately taken off the fire, and allowed to stand quietly for about ten minutes. The coffee is ready for use when the powder swimming on the surface falls to the bottom on slightly stirring it. This method gives a very aromatic coffee, but one containing little extract.

"Boiling, as is the custom in the East yields excellent coffee. The powder is put on the fire in cold water, which is allowed merely to boil up a few seconds. The fine particles of coffee are drunk with the beverage. If boiled long, the aromatic parts are volatilised, and the coffee is then rich in extract, but poor in aroma.

"As the best method, I adopt the following, which is a union of the 2nd and 3rd: The usual quantities both of coffee and water are to be retained; a tin measure containing half-an-ounce of green berries, when filled with roasted ones, is generally sufficient for two small cups of coffee of moderate strength, or one, so-called large breakfast-cup (one pound of green berries, equal to 16 ounces, yielding after roasting, 24 tin measures to be ½ ounce for 48 small cups of coffee). With [illegible] observations [illegible] the coffee to be employed, after being ground [illegible] information [illegible] made to boil 10 or 15 minutes. The one quarter of the coffee which has been kept back is then flung in, and the vessel immediately withdrawn from the fire, covered over, and allowed to stand for 5 or 6 minutes. In order that the powder on the surface may fall to the bottom, it is stirred round; the deposit takes place, and the coffee poured off, is ready for use. In order to separate the dregs more completely, the coffee may be passed through a clear cloth, but generally this is not necessary, and often prejudical to the pure flavour of the beverage. The first boiling gives the strength, the second, addition to the flavour. The water does not dissolve of the aromatic substance more than the fourth part contained in the roasted coffee.

"The beverage, when ready, ought to be of a brown black colour; untransparent it always is somewhat like chocolate thinned with water; and this want of clearness in coffee so prepared does not come from the fine grounds, but from a peculiar fat, resembling butter, about 12 per cent. of which the berries contain, and which, if over-roasted, is partly destroyed. In the other methods of making coffee, more than half the valuable parts of the berries remains in the 'grounds' and is lost.

"To judge as favourably of my coffee as I do myself, its taste is not to be compared with that of the ordinary beverage, but rather the good effects might be taken into consideration which my coffee has on the organism. Many persons, too, who connect the idea of strength or concentration with a dark or black colour; fancy my coffee to be thin and weak, but these were at once inclined more favourably, directly I give it a dark colour by means of burnt sugar, or by adding some substitute. The real flavour of coffee is so little known to most persons that many who drank my coffee for the first time, doubted of its goodness, because it tasted of the berries. A coffee, however, which has not the flavour of the berry, is no coffee, but an artificial beverage, for which many other things may be substituted at pleasure. Hence it comes that if to the decoction made from roasted chicory, carrots, or beetroot, the slightest quantity of coffee be added, few persons detect the difference. This accounts for the great diffusion of each such substitute. A dark mixture, with an empyreumatical taste, most people fancy to be coffee. For tea there are no substitutes, as everybody knows what real tea is like."—*Id.*

MARKET REPORT.

LONDON, June 13.

COFFEE.—The parcels offered to-day went off steadily at yesterday's currency. 600 casks, 90 barrels, 630 bags plantation Ceylon chiefly solds triage and ordinary, 67s. to 71s; small to middling, 74s. to 84s.; good middling to bold colour, 85s. to 96s.; peaberry, 90s. to 93s. 6d.; 1400 bags native Ceylon sold, good ordinary, 71s. 6d.; bold, 78s. to 78s. 6d; peaberry, 75s. (privately 1000 bags now landing sold at 72s.) Of 1200 cases 350 bags Wynaad plantation 200 only sold, new crop triage, 67s. 6d. to 74s. 6d; middling, to good middling, 78s to 85s.; peaberry, 92s. to 93s. 6d., ordinary mixed grey, old crop, 75s. to 76s. Of 1000 packages Mocha about 400 sold, ungarbled, 77s. 6d. to 85s.: greenish 87s. 6d. to 90s.; good, 95s. to 98s.; yellowish, 102s. 170 bags Singapore sold at 72s to 76s: and 1500 bags old crop Costa Rica, at 77s. to 82s. 500 bags Santos, bought in, at 71s. 6d. to 75s.

SUGAR. The business transacted to-day has been moderate. Prices in some cases show a slight decline. 600 casks British West India sold—Antigua, 32s. 6d. to 35s; Dominica, 33s. 6d. to 34s. 6d; Jamaica, 33s. to 34s, 500 cases 800 bags Bahia offered by auction met with a dull demand, and barely one-half found buyers: dabs, 26s. to 27s.: low to good strong brown, 27s. to 31s. Refined dull of sale, and prices in buyer's favour. Of 200 packages Dutch crushed offered by auction, 70 barrels sold at 43s. Molasses 90 puncheons Antigua sold at 16s, and a floating cargo of 560 puncheons Trinidad at 14s. 6d.—*Home News.*

CALCUTTA, 24th June 1872.

INDIGO.—The advices received during the past week from *Tirhoot*, *Chumparun* and *Cawnpore*, are mostly favourable: there are a few complaints here and there of the fall of rain having been rather more than was wanted, but as a rule the weather has been just what was needed for the plant, which is now generally well reported on. Where manufacture has commenced, the plant is yielding fairly. By the end of the month we expect that all factories will be at full work.

In *Lower Bengal* matters on the whole promise fairly. There are some complaints of too much rain in *Jessore*, and in *Pooneah* the fall of rain has been excessive, causing some of the small local rivers to overflow their banks, and submerge a quantity of plant. In *Malda*, *Moorshedabad*, and *Bhaugulpore*, there has lately been as much rain as was wanted, and most concerns are now at work.

The reports from most of the *Benares Zillahs* do not, we regret to say, speak very favourably of the appearance of the *Khooshee*, the roots of which sustained injury from the excessive rain of last year. The *Jowanee* plant, sown on irrigated lands, is reported to be looking well, and now that rain has fallen, planters will lose no time in putting in their *Jeerooa* crop. In the *Doab*, we hear that rain has fallen in some zillahs, but is still sadly wanted in others.

RAW-SILK. Owing to scanty supplies, a small business has taken place since our last issue. The following are the chief sales.—About 3 bales Sultanpore at Rs. 23-8; 9 bales K M J Nimtollah filature at Rs. 21-12; 3 bales C G D H Durungabad at Rs. 21-5; 3 bales J W Cossimbazar and 4 [illegible] G McP rejections at Rs. 20-8; 2 bales G M J at Rs. 19-8; and about 10 bales native Jungypore at Rs. 15-4 and Rs. 17-4 per factory seer. The sale of G G McP Crapes reported in our last has not been confirmed. The produce of the J A R W Radnagore Rainy Bund has been sold "to arrive" in London. The first arrivals of the Rainy Bund may be expected in a fortnight.

TEA.—Auctions comprising 1791 packages, took place on the 19th instant, 1072 only were sold; of the rest, a large portion was withdrawn for very high limits, and some had not arrived in time for sampling. The biddings were exceedingly brisk, and high prices ruled throughout. 2000 chests, nearly all of Cachar growth, are up for sale this afternoon.

JUTE.—This article becomes daily more depressed, owing in part to the weakness of the Home market, and the near approach of the new crop, but especially owing to the action or inaction of the Special Committee on the Jute Warehouse Act. The uncertainty regarding the operation of this Act has created a sort of panic in the Bazar, and holders of Jute are anxiously disposing of their stock at heavy loss. It is to be feared the business in Jute will come to a dead lock unless the examination and registration of screws and godowns is attended to forthwith.—*W. Moore and Co's Market Report.*